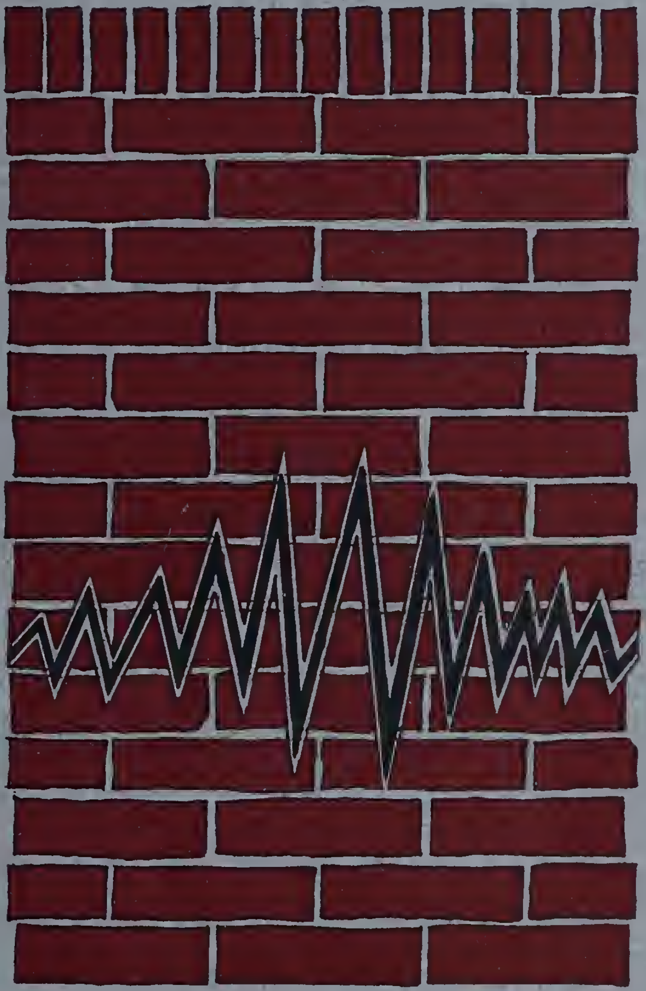
EARTHQUAKE HAZARDS AND HOUSING

Volume 2



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CENTER FOR ENVIRONMENTAL
CHANGE, INC.
For
SAN FRANCISCO
DEPARTMENT OF CITY PLANNING

March 1987

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EARTHQUAKE HAZARDS AND HOUSING

APPENDIX 1

UNREINFORCED MASONRY SEISMIC STRENGTHENING WORKSHOP AND COST ANALYSIS

Sponsored by:

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Berkeley, California 94703

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with funding from:

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I. INTRODUCTION

FOREWORD

This study on existing hazardous Buildings and retrofit concerns is a joint effort between two seismic research projects at the University of California at Berkeley. These research projects, led by principal investigators from the Department of Architecture, address the economic and social impacts of the seismic retrofit of existing buildings in an urban setting:

Project A:

"Earthquake Hazards and Housing: The Impact of a Retroactive Seismic Upgrading Ordinance on Low Income Housing in San Francisco" is funded by the City and County of San Francisco, Department of City Planning. The Principal Investigator is Professor Mary Comerio. The data collected has been used to develop a prioritized set of guidelines for the selection of design measures appropriate for the seismic upgrade of typical multi-unit residential buildings in San Francisco, particularly in the Chinatown and Tenderloin districts. It has been published through the Center for Environmental Change, Inc.

Project B:

"Retrofit Design, Analysis, and Risk Assessment of Existing Buildings" is funded by the National Science Foundation and is a part of a cooperative research protocol with the People's Republic of China. The Principal Investigators are Professor Henry J. Lagorio and Professor Howard Friedman. The data collected from this workshop as well as the retrofit methodology developed will be published as technical reports through the Center for Environmental Design Research at U.C. Berkeley, for distribution to design professionals and earthquake engineering researchers.

Any observations made in this publication, including any opinions, findings, assessments, summaries, conclusions and recommendations expressed, are those of the authors, individual contributors, and research participants and do not necessarily reflect the views or policy of NSF in Washington, D.C., or the San Francisco Department of City Planning.

PURPOSE

The general purpose of this study is to examine various strengthening methods and associated costs for the seismic upgrade of unreinforced masonry buildings. The workshop focused on design factors that significantly affect the strengthening process and the overall upgrading costs. These factors include: 1) existing conditions: building size, height, configuration, structural strength, 2) method of strengthening, and 3) level of seismic upgrade. The primary objective of this study is to determine the effect of each of these strengthening determinants on the final structural strengthening cost as a part of the total project cost.

Due to the extreme range of these cost factors which exist in all upgrading projects, economic data derived from previous strengthening experience may have limited application. Because each seismic retrofit case represents a unique combination of preconditions, assumptions and strengthening design, the cost data, in general terms, is relatively untransferable from one project to another, or from region to region. While previous experience in seismic upgrading of URM projects has increased technical knowledge, a cost relationship methodology has not yet been developed because cost comparisons between buildings rehabilitated at different times under different assumptions are difficult. The workshop was designed in such a way that the post-workshop cost analysis would utilize consistent construction details in an effort to create a system for measuring costs which would allow comparison between similar construction methods in different building conditions or between different levels of upgrading work on the same building. This in turn provides a useful data base for making generalizations about seismic upgrading costs.

One of the fundamental goals of the workshop was to establish the basic cost of strengthening and representative cost relationship factors for each variant condition that may occur in any URM building. The variants may include: level of force resistance, size and height of building, etc. For the purpose of this study, a four story rectangular residential building with one open facade was considered as the basic prototypical building. From the evaluation of this prototype, it was anticipated that a cost pattern could be established to account for seismic strengthening costs with variations on the basic prototype such as height, configuration, strengthening, method, etc.

This study consists of two portions: 1) engineering design of the seismic strengthening design, and 2) develop-ment of cost methodology. The design workshop called together building design professionals to investigate and respond to a set of "building scenarios". Each scenario is based on an actual representative building and singles out a variant condition that deviates from the prototypical basic building. The participating group of building professionals was to submit typical conceptual strengthening designs for these building scenarios. The cost analysis portion of the study followed this engineering design workshop, to determine the costs associated with each strengthening scenario and the design variants based on the conceptual designs submitted by the engineers. The cost analysis was conducted by construction cost estimators with input from architects, engineers and builders.

II. WORKSHOP ORGANIZATION

PARTICIPANTS

Engineering Group:

Peter Culley, Peter Culley & Associates
Eric Elsesser, Forell/Elsesser Engineers
Bill Holmes, Rutherford & Chekene Consulting Engineers
Dan Shapiro, Shapiro, Okino, Hom & Assoc. Engineers

Advisory Group:

Bob Preece, Preece, Goudie and Associates Engineers
John Robertson, Dome Construction*
Lee Saylor, Lee Saylor Inc. Cost Consultants
Leon Sugarman, Kaplan/McLaughlin/Diaz Architects

Research Group:

Mary Comerio, Associate Professor
Howard Friedman, Professor
Henry Lagorio, Professor
Elizabeth Newman, Research Assistant
Kit Wong, Graduate Researcher

Visiting Researchers:

Chen Dasheng, Research Professor,
    People's Republic of China
Amit Ghosh, Chief of Comprehensive Planning,
    City of San Francisco
Lulu Hwang Mabelitini, Translator
Haresh Shah, Professor, Stanford University*
Howard Thurston, Graduate Researcher,
    Stanford University
Stephen Tobriner, Professor, U.C. Berkeley
Yang Yuchen, Researcher, People's Republic of China

* Unable to attend

BIOGRAPHIES OF KEY CONSULTANTS

PETER CULLEY, President and Chief Executive Officer of Peter Culley & Associates, is a licensed Structural Engineer in the state of California. His professional activities center on initial project evaluation and conceptualization; and also general consultation with owners and architects to evaluate all aspects relating to project feasibility, parti-cularly in respect to existing buildings. Further, he has participated in evolving many new standard techniques in the field of commercial and historic restoration. Mr. Culley is a member of many professional associations, including the Structural Engineers Association of Northern California and the New Zealand Institute of Engineers.

ERIC ELSESSER, Vice President of Forell/Elsesser Engineers, is a licensed Structural Engineer with 25 years experience in private practice. Mr. Elsesser is a past President of the Structural Engineers Association of California and currently chairs the American Society of Civil Engineers' Committee on Seismic Effects. He has participated in research and code writing for 20 years, and is currently involved in the development of new structural design concepts such as base isolation.

WILLIAM T. HOLMES, Vice President of Rutherford & Chekene Consulting Engineers, is a licensed structural engineer with over 20 years' experience in all phases of building design and evaluation. He was President of Applied Technology Council in 1985-86 and is the President-elect of the Structural Engineers Association of Northern California for 1987-88. Additionally, Mr. Holmes has authored several papers on the seismic rehabilitation of buildings.

ROBERT PREECE is President of Preece, Goudie and Associates, a consulting engineering firm in San Francisco which has been in business for almost 10 years. Mr. Preece's practice includes retrofitting existing buildings to meet earthquake standards. Mr. Preece is a past President of both the Structural Engineers Association of California and Consulting Engineers of California and currently is a member of the City of San Francisco Mayor's Task Force on Seismic Hazards. Additionally, he has written papers on earthquakes and earthquake resistant building design.

JOHN ROBERTSON has been a licensed architect in the state of California since 1975. He has been involved in Bay Area architecture and construction for the last 17 years. Since 1981, Mr. Robertson has been a Construction Manager and Estimator at Dome Construction Corporation, a San Francisco firm specializing in alteration and renovation work in the Bay Area. In his current position as Director of Estimating, he has been responsible for estimating all historic and seismic renovation projects completed by Dome.

LELAND S. SAYLOR, President of Lee Saylor, Inc., Consulting Cost Engineers, is a licensed General Contractor, Engineering (A) and a General Contractor, Building (B) in California. Further, he is certified as a Cost Engineer and Professional Estimator. Mr. Saylor is the responsible Principal for all project estimates and has experience as a cost engineer and project manager. He has been a lecturer in cost engineering at Stanford University and the University of California, Berkeley and authors the yearly manual "Current Construction Costs.

"DANIEL SHAPIRO, Principal at Shapiro, Okino, Hom and Associates, Engineers, is a licensed Structural and Civil Engineer in California. His San Francisco firm has worked on many seismic rehabilitation projects. Mr. Shapiro is a past President of both Applied Technology Council and the Structural Engineers Association of Northern California

WORKSHOP PREPARATION

Prior to the workshop, much research work was done by Berkeley research staff to ensure the correctness of building data and the applicability of workshop results. Three major tasks completed were as follows:

1. Identification of Residential URM Prototypes -
One of the first tasks was to define the typical characteristics of URM residential buildings. The research staff performed field surveys as well as an analysis of data on URM buildings collected by the City and County of San Francisco Bureau of Building Inspection. The range of prototypical size, configuration, height, facade patterns, and general structural characteristics were assessed. We are grateful to San Francisco's Bureau of Building Inspections for providing the building survey data as well as existing construction documents of typical buildings.

2. Development of Engineering Prototypes for Workshop -
From the data gathered in task 1, five "engineering prototypes" were selected for evaluation during the strengthening workshop. Five actual buildings were chosen to reflect a variety of typical characteristics of URM residential buildings. Architectural drawings of existing conditions in these five buildings were produced by the research staff for the workshop. The existing drawings were based on original construction documents (recorded on microfilm at the Bureau of Building Inspection). In the occasional instances when the documents were incomplete, additional information was extrapolated from archival records of similar buildings. The drawings of the five prototype buildings used during the workshop are included in Section VII-b.

3. Earthquake Regulations Research -
A comprehensive review and comparison of existing earthquake ordinances was performed to establish the appropriate strengthening levels to be addressed during the workshop. From the review, a synopsis of the major code requirements, as well as a graphic comparison of strengthening requirements relative to base shear, was produced and provided to participants. This information is included in Section VII-c. The research staff also set three tentative levels of strengthening for the workshop in terms of detail requirements and allowable stress values for existing materials. The tentative levels of upgrade were chosen to repre-sent a reasonable range of alternatives. It was understood that the levels selected would be reviewed and modified by participating engineers at the beginning of the workshop.

GENERAL SCOPE

The July 1st workshop was primarily devoted to the engineering design portion of the study. During the one day workshop, four design engineers, assisted by an advisory group, jointly proposed solutions to eight building scenarios as a means of establishing typical strengthening designs for the URM residential building type.

The strengthening solutions proposed during the workshop were intended to model typical and average strengthening solutions under the given upgrading requirement levels. The proposed solutions, in the opinion of the designers, were not to reflect esoteric nor atypical upgrading techniques, as the objective of this economic study is to assess the average cost of strengthening.

Although two discussion sessions were scheduled during the workshop, discussions were held to a minimum in favor of developing design concepts. The main purpose of the discussion sessions was to address questions and answers which grew out of the design work, and to clarify assumptions and objectives.

Following the workshop, each design engineer was expected to propose preliminary solutions to two additional scenarios, allowing the engineers to further evaluate and design in greater detail at their respective offices. Each engineer was responsible for developing and documenting preliminary strengthening designs for four scenarios in total. The Berkeley research team collected finished conceptual design drawings from individual design offices on July 15th, and in turn submitted them to the cost estimators for economic analysis.

Figure 1 shows a sampling of strengthening cost determinants. These determinants may reflect the variety of conditions in an existing building or the strengthening process to be used. Each of these was singled out in the "design scenarios" for the individual effects on strengthening techniques and consequently the impact on cost.

Group 1: Number of stories
- a 2 stories
- b. 4 stories
- c. 6 stories

Group 2: Level of upgrade
1. V = .1 W (max) L.A. Ordinance for Class III and IV
2. V = .133 W (max) '73 UBC, L.A. Ordinance for Class II
3. V = .186 W (max) '85 UBC

Group 3: Methods of Strengthening
- a. Steel brace frame systems
- b. Concrete shear wall systems

Group 4: Footprint Size (Area)
- a. Small less than 2,200 sq. ft.
- b. Medium between 2,200 and 7,500 sq. ft.
- c. Large greater than 7,500 sq. ft.

Group 5: Building Configuration
- a. Basic rectangular
- b. L shaped
- c. Open ground story - 3 sides open
- d. Corner buildings

Figure 1
Major Cost Determinants

BUILDING NO.	SCENARIO NO.	NUMBER OF STORIES	CONFIGURATIONS AND FEATURES (a)	STRENGTHENING LEVEL	STRENGTHENING METHOD	ASSIGNMENT AT WORKSHOP (b)	ASSIGNMENT AFTER WORKSHOP (b)
1	1	2	B	1	S	-	C
1	2	2	B	1	C	-	C
1	3	2	B	2	S	S	-
1	4	2	B	2	C	-	H
2	5	4	B	1	S	C	-
2	6	4	B	1	C	H	-
2	7	4	B	2	S	S	-
2	8	4	B	2	C	E	-
2	9	4	B	3	S	-	C
2	10	4	B	3	C	-	H
3	11	6	B	1	S	-	E
3	12	6	B	1	C	-	S
3	13	6	B	2	S	C	-
3	14	6	B	2	C	-	S
4	15	4	C	2	S	H	-
5	16	6	L	2	OPEN	E	-

a. Key:

B - Basic
C - Corner
L - "L" Shaped

b. Key:

H - Holmes
E - Elssesser
S - Shapiro
C - Culley

Figure 2
Conceptual Design Scenarios

9:00 - 9:15	Coffee & Introductions.
9:15 - 9:30	General briefing - objective of the study, procedure of conceptual design, presentation of the residential building types.
9:30 - 11:00	Discussion on the strengthening levels in the economic study to clarify the specific requirements for each level of conceptual design.
11:00 - 12:30	Conceptual design of scenario #5, 6, 7, 8 by the four design engineering groups aided by the advisory and research groups. These scenarios represent the different strengthening conditions of the basic 4 story URM residential building. Each group is responsible for one preliminary solution for the assigned scenario to be reviewed at 12:00. Preliminary designs should indicate location and approximate size of new members.
12:30 - 1:00	Review of conceptual engineering design solutions to scenarios # 5, 6, 7, 8 by all groups, criticisms and suggestions for improvements.
1:00 - 2:00	Lunch.
2:00 - 4:00	Discussion of retrofit techniques for different building configurations and features to determine which features or configurations of existing buildings are most vulnerable. Discussion of appropriate strengthening levels for residential buildings for San Francisco low-income areas. Assignment of priority to strengthening tasks such as: addition of anchors, shear bolts, diaphragm strengthening etc.
4:00 - 5:00	Conceptual design of scenarios #3, 13, 15, 16. These scenarios represent height, feature and configurational variants of the basic prototypical URM residential buildings. Each engineering group is to propose a solution to the assigned scenario.
5:00 - 5:30	Review of conceptual engineering design solutions to scenarios #3, 13, 15, 16, criticism and suggestions for improvements. Closing statements.

Figure 3
Schedule of Workshop

III. SYNOPSIS OF WORKSHOP DISCUSSIONS

Because of the close interrelations of the strengthening issues, the discussion of one issue must naturally touch upon another aspect of seismic upgrading. However, the issues and ideas presented during the workshop's discussion sessions are extracted and presented here in three topic areas for the sake of clarity:

1. Strengthening Levels and Methods
2. Condition of Existing URM Buildings
3. Minimal Effective Upgrade

PART I: STRENGTHENING LEVELS AND METHODS

The objective of this discussion was to clarify and check engineering and cost analysis assumptions before the development of typical engineering strengthening design. Since the cost data would be based on the engineering design, it was critical to insure that the assumptions used in engineering solutions developed by the four engineers be consistent.

Discussion opened by recapping the basic concepts of base shear. In general, building codes regulate the seismic resistance of structures by requiring the structure to withstand horizontal forces equivalent to a portion of its weight. This requirement is expressed in the current Uniform Building Code (UBC) in the equation $V = ZICSKW$. In essence, the base shear coefficient, or the product of ZICSK, is the percentage of the building weight a structure is required to withstand. Different retrofit codes have different requirements for the base shear coefficient. The objective of this discussion was to determine the strengthening levels of force requirement appropriate for the workshop and subsequent economic analysis.

Associated with the base coefficient requirements, two other factors also affect the overall strength requirements: 1) the required shear force versus building period relationship and 2) stress values given to existing materials and allowable overstresses. The current UBC, as well as some retrofit codes, reduces the base shear requirements as the period of the structure increases. However, other ordinances do not consider this allowance, requiring the same base shear regardless of the building period. Concerning material stresses, most retrofit ordinances either explicitly or implicitly recognize the strength of existing materi-als with little variation in values.

Prior to the workshop, the Berkeley research staff tentatively set the three strengthening levels at maximum shears of 18.6%, 13.3% and 10% of the building weight. Level 1 (10%) is modeled after the Los Angeles requirement for Class III and IV buildings. Where the shear requirement does not vary with building period. Level 2 (13.3%) is modeled after the 1973 Uniform Building Code. Level 3 (18.6%) is modeled after the 1985 Uniform Building Code. Both level 2 and level 3 were tentatively proposed to follow code standard reduction for building period. (See Figure 4 for graphic representation.)

Discussion by workshop participants indicated that the period of the tall residential buildings, as established by the code prescribed method, is quite large, approaching that of 0.5 seconds. (See Figure 4.) Whereas this long period does not affect the force requirement of levels 1 and 3, the force required by level 2 substantially drops to below level 1. It was pointed out that the force requirements for this type of building are essentially very close between level 1 and level 2. Suggestions were made that it may be more beneficial for this workshop to hold base shear requirements constant with respect to building period for levels 2 and 3 in order to better assess the relationship between strength level and cost of upgrade.

The engineering groups as well as the cost consultants and the research group have agreed with this observation and agreed to adopt level 2 and level 3 as a horizontal line level for the purpose of this workshop.

The discussion proceeded to address the acceptable strength values given to existing materials, allowable over-stresses, and to clarify the detail requirements of each level. After extensive discussion, it was decided that in order for the levels to be comparable, there must be some consistency in the values given to existing materials. At least, levels 1 and 2 should have the same values. The stress values and allowable overstresses proposed by the Los Angeles ordinance were essentially adopted for levels 1 and 2 with a few changes. The allowable material stress values that the Los Angeles retroactive URM ordinance recognizes are representative and very similar to those of other retroactive codes.

A proposed difference lies in the shear strength of existing masonry. The allowable stress value has been set at 10 psi for the purpose of the workshop since no on-site shear test data was available. The 10 psi value was agreed upon by the workshop participants as a possible average shear resistance value in spite of lower values recognized by the Los Angeles and Long Beach retroactive codes. Because the means to assess the actual shear resistance (such as core test or inability test), are relatively unsophisticated, the actual resistance of the brick is difficult to determine, but is clearly higher than the present nominal values. It was also clear that unless a shear resistance of 10 psi is developed in the existing brick, shear resistance of the building in the longitudinal direction probably cannot be provided by the URM walls without additional bracing even at the lowest strength level (10%). If additional bracing were needed for the longitudinal direction, the cost for upgrade would be practically the same for levels 1 and 2. Thus, for the purpose of the workshop, it was decided to use an allowable value which is both indicative of a probable actual value and representative of a clear step in strengthening level. It should be recognized that the strengthening cost derived by the workshop would be applicable mainly to buildings constructed of URM capable of resisting 10 psi of shear stress.

Level 3 represents the closest level of strength to current UBC requirements achievable via strengthening. Because of this, the engineers have decided that no shear stress values should be given to existing material in horizontal shear.

WORKSHOP STRENGTHENING LEVELS

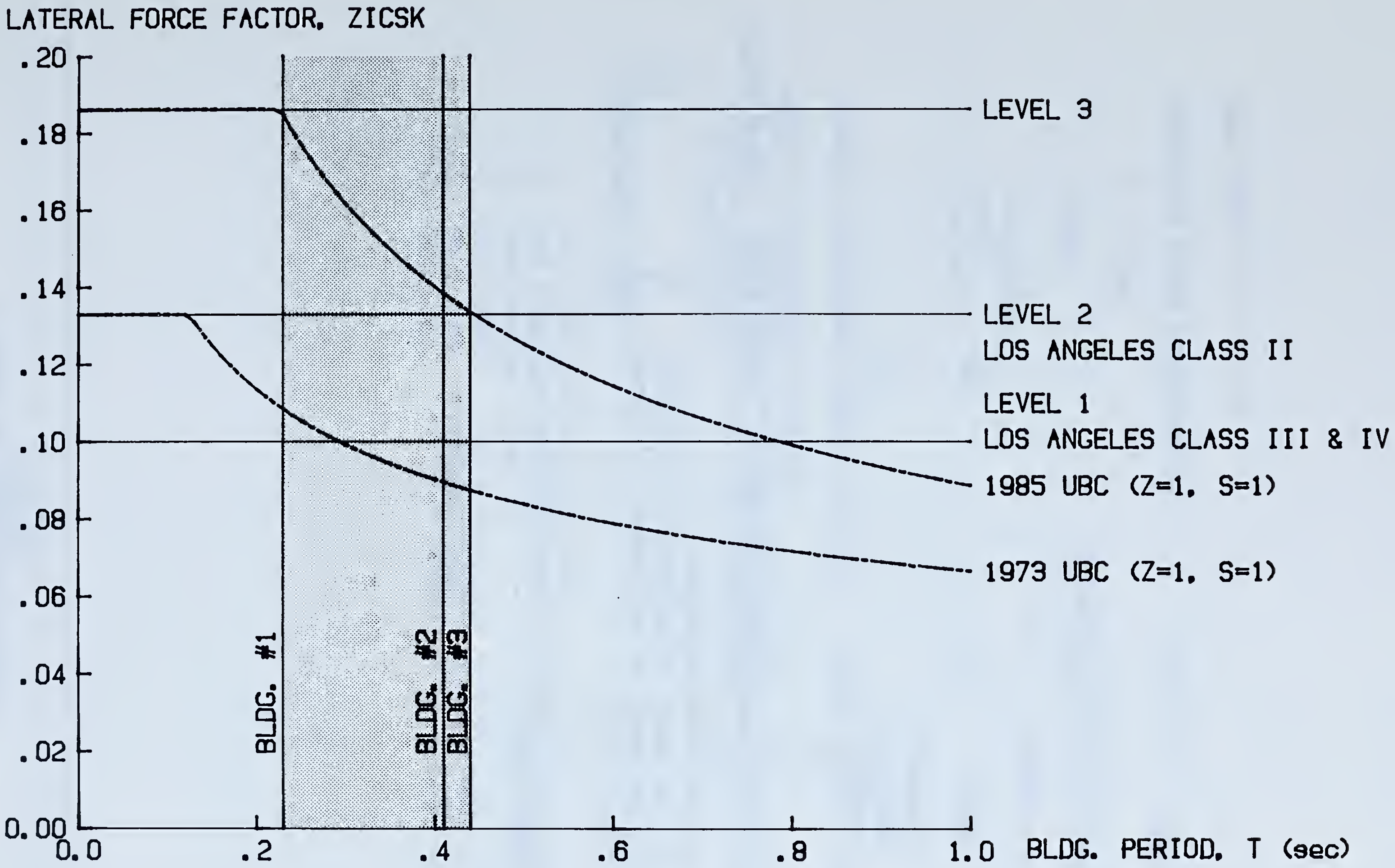

Figure 4

Base Shear: V = 0.1W

Component Force Requirements:

$F_p = Z C_p W_p$ $Z = 1$

Parts	Cp
diaphragm	.1
walls	.2
parapet	1.0

Height to Thickness Ratio (h/t max)	without cross walls	with cross walls
walls in one story buildings	13	16
walls in 1st story of multistory buildings	15	16
walls in top story of multistory buildings	9	14
all other walls	13	16

Equivalent Codes:

1. Los Angeles Class III & IV
2. Palo Alto occupancy < 100

Figure 5
General Definition of Level 1

Base Shear: V = 0.133W

Component Force Requirements:

$F_p = ZC_pW_p$ Z = 1

Parts	Cp
diaphragm	.1
walls	.2
parapet	1.0

Height to Thickness Ratio (h/t max)	without cross walls	with cross walls
walls in one story buildings	13	16
walls in 1st story of multistory buildings	15	16
walls in top story of multistory buildings	9	14
all other walls	13	16

Equivalent Codes:

1. 1973 Uniform Building Code
2. San Francisco Rehabilitation Seismic Requirement
3. Los Angeles Class II
4. Long Beach
5. Palo Alto occupancy > 100
6. Santa Ana

Figure 6
General Definition of Level 2

Base Shear: V = .186W

Component Force Requirements:

Diaphragms

The shear requirement for diaphragms is given by the equation,

Fpx(max) = 0.30ZIWpx, where Wpx= weight of diaphragm at level x plus tributary weight.

Walls and Parapets

The shear requirement for these components is given by the equation,

Fp=ZICpWp, where Wp=weight of specified portion of structure and Cp is given as follows:

component	direction of force	Cp
wall	normal to surface	0.30
parapet	normal to surface	0.80

Equivalent Code:

1985 Uniform Building Code

Figure 7
General Definition of Level 3

1.	Horizontal Diaphragms	
a.	Roofs with straight sheathing with the roof covering applied directly to the sheathing.	100 pounds per foot for seismic shear
b.	Roofs with diagonal sheathing with the roof covering applied directly to the sheathing.	400 pounds per foot for seismic shear
c.	Floors with straight tongue and groove sheathing.	150 pounds per foot for seismic shear
d.	Floors with straight sheathing and finished wood flooring.	300 pounds per foot for seismic shear
e.	Floors with diagonal sheathing and finished wood flooring.	450 pounds per foot for seismic shear
f.	Floors or roofs with straight sheathing and plaster applied to the values for items 1-a and 1-c joist or rafters.	Add 50 pounds per foot to the allowable
2.	Shear Walls	
	Wood stud walls with lath and plaster	100 pounds per foot each side for seismic shear
3.	Plain Concrete Footings	f'c = 1500 psi unless otherwise shown by tests
4.	Douglas Fir Wood	Allowable stress same as No. D.F.2
5.	Reinforcing Steel	f'c = 18,000 psi maximum
6.	Structural Steel	f'c = 20,000 psi maximum
7.	Unreinforced Masonry in shear	10 psi + 10% of axial stress due to weight of wall above

Figure 8
Values for Existing Materials for Levels 1 & 2

PART II: CONDITION OF EXISTING URM BUILDINGS

The overall objective of the discussions on existing conditions was to clearly define the extent of the seismic hazard. Participants in the workshop have contributed to the collective knowledge of the problem by presenting their understanding of these buildings. The ideas summarized below were brought up in the discussion at different times during the workshop.

SPECIAL HAZARD CONDITIONS

To stimulate discussion at the beginning of the workshop, Professor Mary Comerio presented photographs of typical URM residential buildings in San Francisco. Construction drawings for these buildings were provided before and during the workshop to illustrate the construction details of five prototypical buildings. These photographs and drawings were used to represent the average conditions of residential URM structures in San Francisco. The participants were asked to comment on conditions that may not be typical but deserve special treatment during the strengthening process. In addition to lack of wall-diaphragm continuity, the engineers agreed that the major vulnerable features are:

1) Torsional Problems - this includes corner buildings with two open facades or buildings with one very open facade when other walls are solid, as well as buildings with irregular configurations.

2) Vertical Discontinuity - this includes buildings with an open first floor (soft story). Some URM residential buildings have commercial first floors that tend to have large windows and no interior partition walls, creating a discontinuity for shear transfer from the above floors.

3) Long Diaphragm Span - in long narrow buildings, masonry walls that can serve as shear walls may be far apart. This creates a high shear stress in the floor diaphragms.

As the discussion continued the effectiveness of individual building strengthening was questioned in view of the larger context in a tight urban area. In dense city lots, the space between older buildings is small and in many cases non-existent. The buildings of an entire city block may in fact act as one integral structure. Thus a single strengthened building within a block of unstrengthened buildings may be subjected to a high percentage of the earthquake generated force of the other buildings. Eric Elsesser made a slide presentation of this adjacency problem. He presented the idea of treating a city block as a whole during the strengthening process. He also presented some difficulties involved: buildings in a block are often not uniform in height, they step up or down hills, or the floor levels are not aligned. The participating engineers have agreed that it is more structurally effective if the strengthening process considers an entire block at a time rather than individual buildings. The participants also have recognized the logistic difficulties of this approach. However, if the legalities are overcome, it may be of an economic advantage to provide a high level of strengthening at a part of the block (i.e., at the corner buildings), and allow these structures to carry the load generated by the other buildings.

EXISTING DETAILS

The issue of effectiveness of existing seismic details, such as band irons and government anchors, was addressed. Professor Stephen Tobriner proposed that most URM buildings built between 1868 and the 1930s in San Francisco have iron plate bands around the entire building and on every floor. It has also been determined that "government anchors" in URM buildings are standard details, at least in California. Tobriner asked if the strength afforded by these elements should be taken into account during strengthening. The engineers replied that the effectiveness of these anchors is questionable as failures of these anchors both in the wood and the masonry ends of buildings have been observed during previous earthquakes. Furthermore, there are no standards governing the design of these anchors. Thus, it was concluded that if these anchors are to be useful in strengthened buildings they would need to be reconditioned.

PART III: MINIMAL EFFECTIVE STRENGTHENING

This discussion was based on the question of what is the maximum benefit one can get for minimal upgrade intervention. A question was posed to the engineers to generate discussion: If an owner were to come to you and ask you to strengthen a building under a voluntary program, and his objective is to prevent collapse with minimal cost, what would you do?.

Mary Comerio has further clarified the question in terms of the San Francisco URM residential rehabilitation objective. She has made a preliminary projection that a $5 to $10 per sq. ft. structural strengthening cost would be absorbed by rental increase without creating major low income displacement problems. She asked if a $5 to $10 per sq. ft. budget for seismic strengthening would be of any benefit. The participating engineers pointed out that the input based on such a budget depends largely on the nature of particular buildings. A $10 per sq. ft. expenditure would probably mean the prevention of collapse hazards in a large percentage of these buildings during a probable earthquake. The engineers, however, also have expressed that this minimal effort would not be sufficient for collapse prevention for all buildings of this type.

As far as the strengthening action for a minimal upgrade, again it was recognized that the appropriate action depends upon the vulnerable features of a particular building. The minimal upgrade solution of an URM building always includes tying walls and floors together. This is the least expensive upgrading measure which accomplishes the greatest reduction of hazard to life safety (building collapse). Additionally, a building may have one or more basic collapse mechanisms (described on pages 25 and 26) and a minimal upgrade solution must address all of those which exist in the given building. In some, appropriate action includes the addition of joist anchors and shear bolts at every level, including collector continuity measures and chord strengthening if necessary; adding minimal transverse braces at lower levels, if necessary to deal with large first floor openings; and reinforcing diaphragm(s) if shear stresses are too high.

IV. WORKSHOP RESULTS AND CONCLUSIONS

The workshop provided an opportunity for the research group to work together with practicing structural engineers and architects in evaluating a variety of seismic upgrading methods for prototypical residential buildings in San Francisco. Three levels of code requirements, and two strengthening methods were applied to the five basic buildings so that in the end, sixteen different design scenarios would be evaluated. Ultimately this would allow us to compare the costs of upgrading in a systematic way.

The workshop served three key purposes. First it was a forum for the discussion of assumptions about codes and standards, as well as building conditions. This was critical in establishing a common base for the engineering de-signs. Second, it allowed each engineer to develop concep-tual designs solutions and present those solutions to the group for feedback before finalizing their work. Because we selected engineers to represent differing points of view regarding the seismic retrofit of existing buildings, it was valuable to expose and discuss those differences. Third, the workshop allowed the participants to get a sense of the scale of work involved in retrofitting residential buildings, as well as the cost implications. This, in turn, led to a discussion on "minimum" upgrading requirements and recommendations for San Francisco.

ENGINEERING ASSUMPTIONS

From the discussion, it was clear that the strengthening level was not a simple variable. While the Los Angeles ordinance fixed the base shear resistance requirements at 10% of building weight (for class III and IV) and 13.3% of building weight (for class II), the Uniform Building Code (UBC) varies the base shear resistance required according to the period of the building, which is a function of building height to width ratio. For the taller 4-6 story residential structures in the study, this means that UBC '73 requirements could be less than the Los Angeles requirement. (See figure 4 for the comparison of code requirements.) To create a legitimate means of comparison, we agreed to use the Los Angeles model for levels 1 and 2.

The acceptable strength values for existing materials was another component of the discussion on strengthening levels. In reality, each building would have to be tested to determine the inherent strength of its materials, however we agreed that in the absence of specific information, a typical number would be 10 psi of shear strength for existing masonry. For the purposes of the workshop the engineers agreed that the stress values and allowable overstresses would be the same as the Los Angeles ordinance requires for levels 1 and 2. Clearly, the value an engineer assigns to the strength of existing materials will greatly affect the design and the cost of the renovation. The strength of existing materials in resisting seismic forces is an area of some debate in the engineering community, and the workshop participants acknowledged the issue, while at the same time, they agreed on a reasonably conservative assumption for our evaluation.

It should be noted that level 3 represents the most current building code (1985 UBC). As such, base shear requirements followed the standards set in the code and no value for resisting shear was assigned to existing materi-als. This is in fact an unlikely upgrading scenario for existing buildings if limited to economic criteria. It was included to document the spectrum of upgrading requirements and their attendant costs. Overall, basic engineering assumptions about base shear requirements and allowable stresses for existing materials have a significant effect on the actual strengthening level. Still, as we worked through the design scenarios we found that there was very little difference in the solutions for levels 1 and 2, in spite of our efforts to distinguish between them. This leads us to the conclusion that the base shear requirements may not be as important as the assumptions about existing materials for setting strengthening levels for unreinforced masonry residential buildings in San Francisco.

BUILDING CONDITIONS

San Francisco is unique in that most buildings are built to the property line, and in the neighborhoods where the majority of unreinforced masonry residential buildings are located, Chinatown, the Tenderloin, and Bush Street, lot coverage is almost always 100%. This circumstance led the workshop participants to a discussion of the value of up-grading an individual building when in fact the buildings on a block might act as one. A creative solution might be to strengthen the corner buildings in every block, or to tie the buildings in each block together. It was unclear how the city could regulate such actions in a society of indivi-dual property owners. Still it is important to note that there was a great deal of concern on the part of the engineers that the upgrading of an individual building in any block might have an adverse affect due to its unreinforced neighbors in the event of an earthquake.

Another point relative to unique conditions in San Francisco is that after the 1906 earthquake, masonry buildings were constructed with band irons or government anchors. These steel ties installed at each floor level were intended to strengthen the buildings. Today the majority of engineers do not place much structural value on these anchors, but again they represent another unknown in our assumptions regarding the strength of existing materials.

COST AND THE MINIMUM ACCEPTABLE UPGRADE

Lee Saylor's participation in the workshop prompted an important discussion of the minimum acceptable upgrade - in engineering terms. Quick calculations showed very little difference in cost either between levels 1 and 2 or between steel and gunite solutions. Mr. Saylor believed that the seismic work would cost approximately $27 per square foot for any of the scenarios.[1] This did not include an upgrade of fire safety or other health and safety code violations that might exist in the buildings. To do the typical plumbing, electrical, and architectural work, he estimated that the costs could double.

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[1] Further analysis showed some variation for detailed cost studies. See Section VI.

This figure is similar to the current costs of renovation in Los Angeles. The city has provided financing for 28 buildings (1186 units). They estimate that the cost of floor anchoring at $1000 per unit, full seismic compliance at $4000-5000 per unit, and complete architectural rehabilitation at $10,000 per unit. Los Angeles uses the average cost per unit because they find the costs per square foot to vary greatly by building size. If we assume a typical residential hotel room to be 120 square feet and we assume a net to gross square foot multiplier of 1.66, then a typical room would be 200 gross square feet or $50 per square foot. While these calculations are rough, they do represent the range of costs we can expect.

The cost estimates were somewhat shocking to the work-shop participants. The costs seemed difficult to absorb given the physical conditions of the buildings and the social conditions of the building owners and occupants. The question was asked, if codes and regulations were put aside, what type of upgrading would you recommend to an owner interested in protecting the lives of the inhabitants? Everyone agreed that tying the floors and walls together was tremendously important. It was pointed out that one would have to spend a great deal more money to achieve an additional increment of safety after tying floors and walls.

Even so, the engineers were uncomfortable with recommending only the first stage of the Los Angeles code because of the variation in building size and type. Instead they suggested a list of minimum safety items (described on page 28) as a shopping list to be considered when evaluating an individual building.[2] There are two reasons for hesitation when recommending safety minimums. First, minimum standards often get translated into maximum requirements and this could leave people with a false sense of security about the seismic safety of their building. Second, seismic upgrading of existing buildings is a relatively new field and our knowledge is limited. This is particularly true of residential buildings where almost no work has been done. The technology is likely to change with experience, and we might be caught in a situation where we would want to change the rules halfway through the implementation of a seismic retrofit ordinance.

The details of an ordinance aside, there was a basic agreement that a minimum seismic upgrade would include joist anchors and shear bolts at every level, some attention to transverse bracing at large first floor openings, and re-nailing existing floors and floor joists and/or adding plywood at roof and ceiling levels (or other appropriate solutions) if the diaphragm shear stress is too high. Further, whatever this solution costs, be it $10 or $12 or $15 per square foot, it represents the minimum, and there is no seismic safety at a $5 per square foot solution.

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[2] Basic Building #2 was analyzed in terms of a minimum upgrade after the workshop. See page 54 for discussion.

The workshop participants did not form a final set of recommendations or conclusions since the engineering studies and the cost evaluations were to take place in the weeks following the meeting. However it would be fair to describe the mood of the discussion and the resulting attitude toward the seismic rehabilitation of residential buildings in San Francisco as one of caution. How and when we upgrade existing buildings is a policy decision as well as an engineering decision.

V. STRENGTHENING PROCEDURES

As the result of the July 1st workshop, engineering strengthening designs corresponding to the 14 scenarios were completed and submitted by the participating consulting engineers. These preliminary designs were used as inputs to the cost analysis portion of the study. The designs, although approximate in nature, described the configurations and the extent of the necessary strengthening work. The submitted drawings show the location and approximate sizes of new structural members to be added as well as some typical details. The engineers agreed at the start that all the design solutions will include joist anchorage, shear bolting, chords, parapet bracing and out-of-plane bracing where necessary. These items are not included in the submitted drawings as the associated costs can be derived on a dollar per linear foot basis from standardized details.

The strengthening design for scenario #7 is included in Section VII-a to illustrate the nature of the engineering design solutions. Scenario #7 is a four story rectangular building strengthened to level 2 with a steel brace solution.

This section presents in detail the strengthening tasks recommended by the engineers and in turn reflected in the resulting cost data.

Anchorage, Shear Bolting, and Chords
(Tying the building together)

To ensure that the building acts as a whole to resist earthquake forces, joist anchors, shear bolts, and steel chords were added to the existing building on every floor and roof levels. There are a variety of possible designs 2 for the above. One which integrates all three elements was chosen as a conservative design for this cost study. (See Figure 9.) For other variations on the design of this strengthening system, see SEAOSC Handbook.

This strengthening task involves installation of steel members, bolts, and blocks. Associated with the structural work, architectural demolition and replacement is also necessary. In the cost analysis, they are differentiated so that they can be properly accounted for under general rehabilitation costs.Structural Work:

- 3/4 inch through bolt or epoxy embedded every 4' o.c.

- Steel strapping approximately 36" long every 4' o.c.

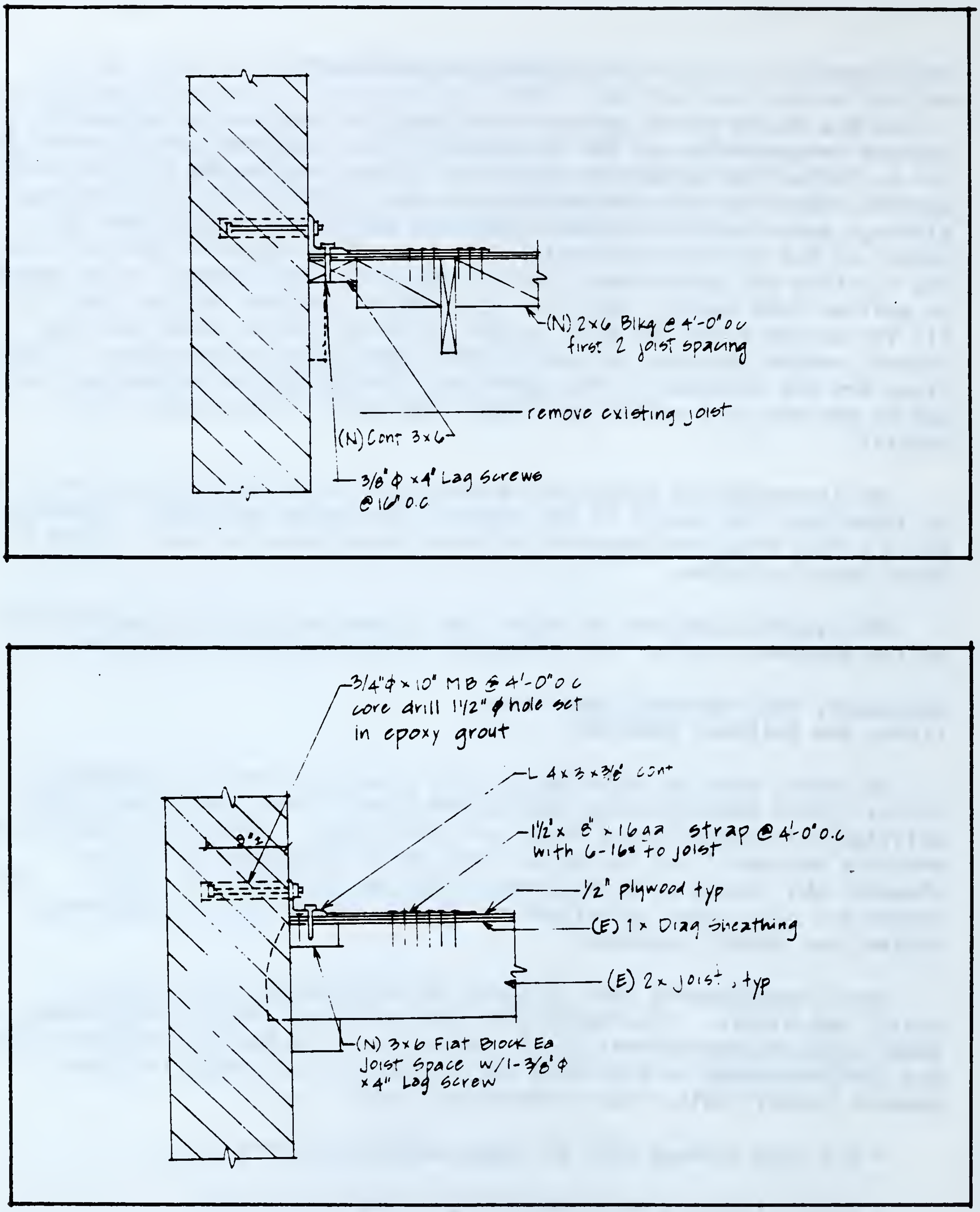

(N) 2x6 Blkg @ 4'-0" o.c first 2 joist spacing
remove existing joist
(N) Cont 3x6
3/8" ϕ x 4" Lag Screws @ 16" o.c
3/4" ϕ x 10" MB @ 4'-0" o.c core drill 1 1/2" ϕ hole set in epoxy grout
L 4 x 3 x 3/8" cont
1 1/2" x 8" x 16 ga strap @ 4'-0" o.c with 6-16d to joist
1/2" plywood typ
(E) 1 x Diag Sheathing
(E) 2 x joist, typ
(N) 3x6 Flat Block Ea Joist Space w/1-3/8" ϕ x 4" Lag Screw
8"±

Figure 9
Anchor, Shear Bolt and Chord/Collector Details
Used For Cost Study

SOURCE: Peter Culley

- 2x blocking added at wall perimeter where joist is perpendicular to wall

- 2x blocking added at strapping where joist is parallel to wall. (Two or three joist spacings need to be blocked.)

- Attachment of steel strapping to steel chord angles (field welded or bolted).

- L4x3x3/8" steel angles for chords (continuous).

Architectural Work:

- removal of plaster finish at wall base or ceiling to expose masonry wall

- removal of finish floor and structural floor approximately 3' around masonry wall to install strapping and blocking

- reinstalling structural flooring

- replacement of floor finish - carpet or vinyl flooring

- reroofing - standard built up roof

- refinishing of walls - plaster patching work near baseboard and trim where needed.

Diaphragm Strengthening
(Controlling deflection and adequate shear transfer)

To prevent masonry wall collapse due to excessive lateral deflection, the existing wooden floors and roof need to be stiffened. Additionally, the diaphragms need to be strong enough to deliver the force generated on each level to the shear walls. Two possible methods are adding plywood sheathing or a horizontal steel truss.

The plywood sheathing is the most common. The addition of sheathing can occur on the top of existing floor or at the ceiling. The new sheathing must be continuous as it acts to transfer shear to shear walls. Openings, such as stairs and ventilation shafts need to be reinforced at the edges with steel members or straps. In residential buildings where there are interior partitions, developing a continuous diaphragm action with new plywood sheathing may be difficult if the existing floors have straight sheathing. Existing straight sheathing requires shear transfer across interior partitions. In this study, this worst possible existing condition is assumed. The cost results are thus biased toward the conservative.

Structural Work:

- 3/8" or 1/2" plywood sheathing added over existing flooring and nailed into joists, provide blocking where necessary
- metal framing clip approximately 16 gauge, closely spaced, nailed to new plywood and bottom plates of interior partition for shear transfer

Architectural Work:

- removal of wall finish, approximately 3" at base of interior partitions
- replace finish floor - carpet or vinyl flooring
- refinish wall - replacement of gypsum, plaster patching and replacement of baseboard.
- reroofing - standard built up roof.

The steel horizontal truss method can be used where plywood sheathing cannot provide adequate strength or stiffness, and at large openings such as light wells. Again, addition of a horizontal truss in residential buildings will incur a high architectural cost as the diagonal members will need to be attached to existing joists and penetrate through interior partitions. Trusses will need to be placed at the ceiling level as not to interfere with existing floors. This method will likely involve major architectural finish work.

Transverse and Longitudinal Bracing
(Stiffening the building as a whole)

Because unreinforced masonry walls have very low shear strength, new shear walls or bracing need to be added to strengthen the building as a whole against lateral forces. In typical URM residential buildings, the transverse walls are usually more open than longitudinal walls, thereforegenerally more bracing is required in the transverse direction as a solid masonry wall has some shear resistance.
Structural Work:

Steel System -
- steel brace frame (member size depends on building)
- new steel collectors that extends outside the braced frame
- new grade beam, mat or pier foundation for new frame

Concrete System-
- new reinforced concrete shear walls - pour in place or pneumatically applied

- new steel collectors

- new grade beams, or foundation

Architectural Work:

- demolition and refinish where steel bracing or shear wall penetrates floors and ceiling.

- Plaster - finish around bracing or shear wall

When shear walls are added where floor joists are perpendicular to the wall, the floors need to be supported during reconstruction as the shear wall need to be vertically continuous. This item is accounted for in the architectural and demolition cost.

Parapet Bracing

Parapet bracing is necessary to prevent the collapse of weak parapets during earthquakes. To accomplish this, the existing parapet can be removed, partly removed and capped with reinforced concrete or braced. Again, there are many ways to brace a parapet. This cost study assumes a diagonal bracing method. (See Figure 10.)

Structural Work:

- continuous L2x2 steel angle bolted to masonry wall

- L2x2 steel angle diagonal brace approximately 4' o.c. attached to roof

- 2x blocking where rafter parallel to the wall.

Architectural Work:

- removal and reinstallation of structural roofing as required to provide blocking

- reroofing (cost accounted for under diaphragm)

Out-of-Plane Bracing
(Preventing buckling of slender walls)

Slender masonry walls have a potential to bow outwards and buckle in earthquakes. This is especially important in the walls of upper floors where the bending stresses are not counteracted by vertical load stresses. Again there are many ways to provide out-of-plane bracing. This study assumes the most common which is to provide vertical steel members which restrain the wall from bowing outwards. (See Figure 11.)

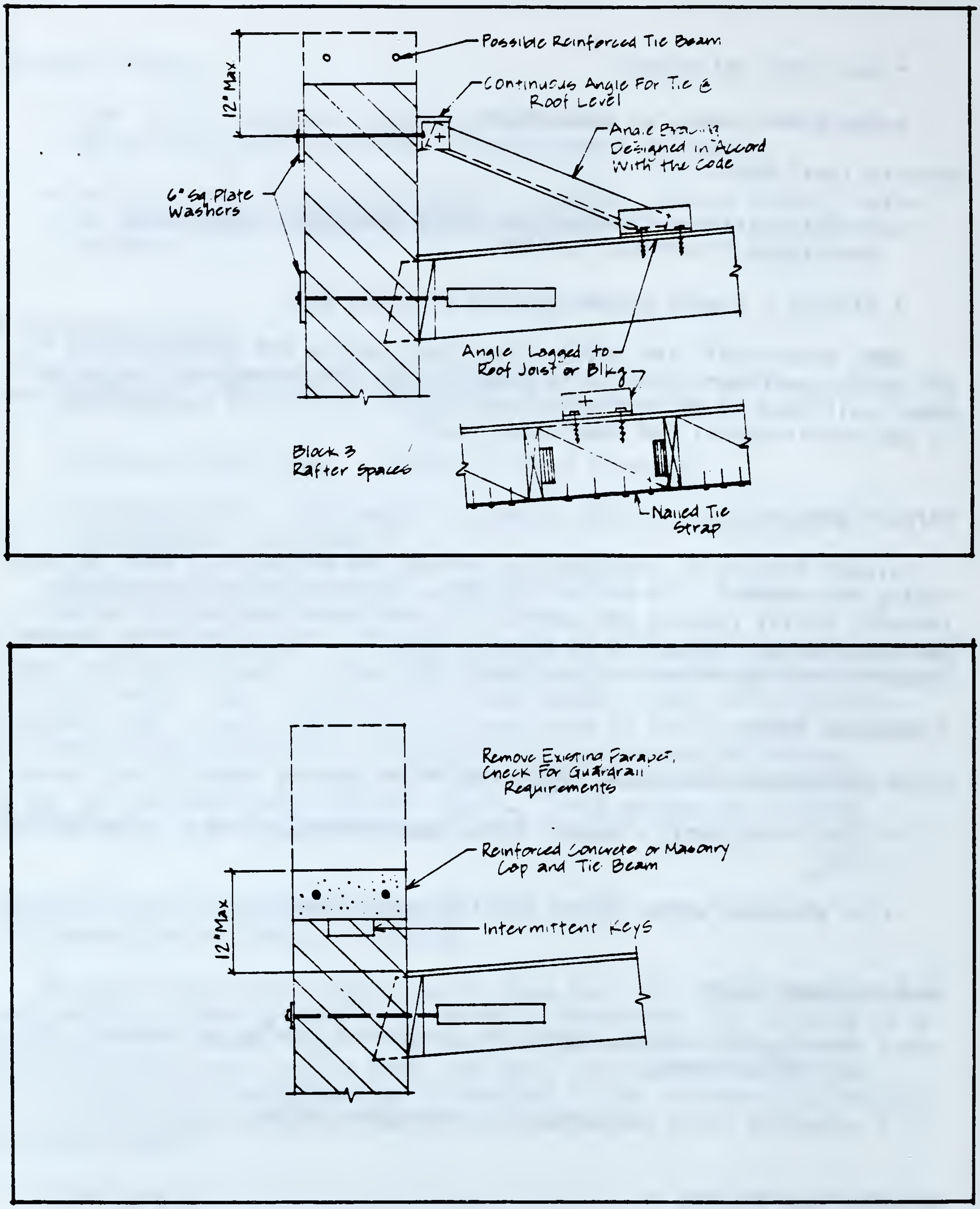
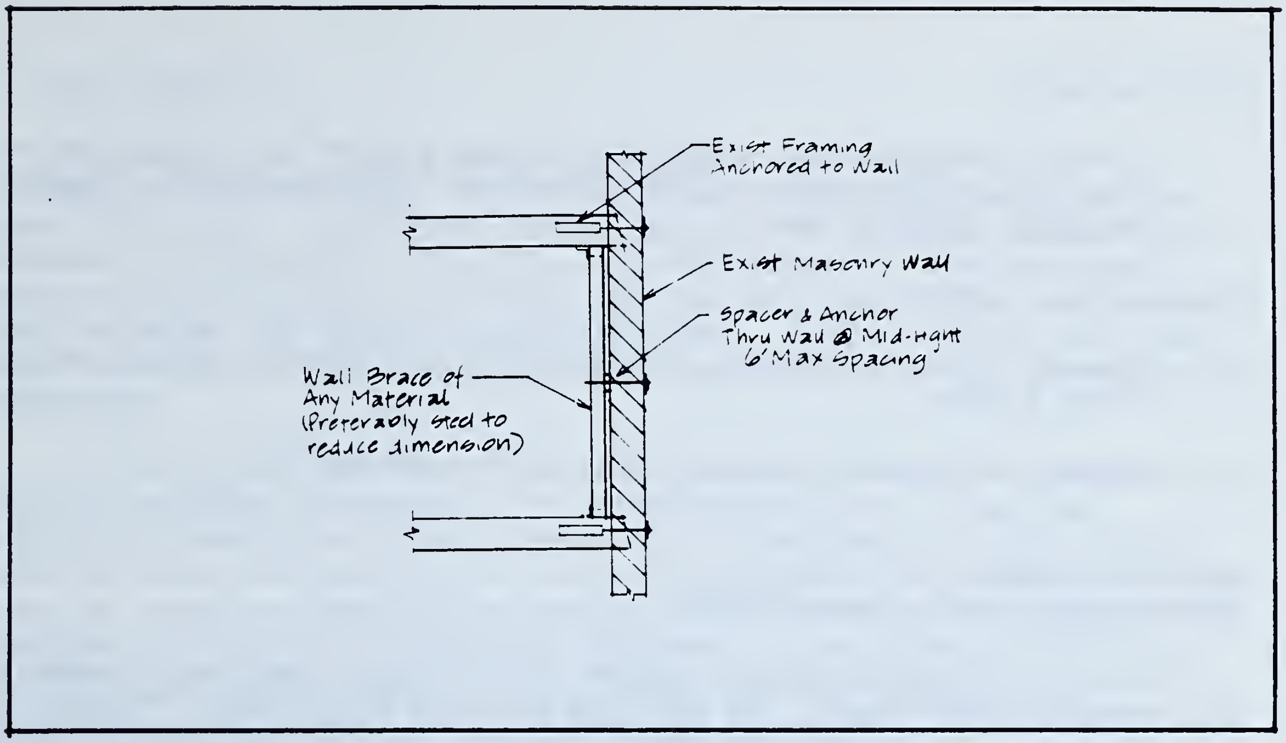

Possible Reinforced Tie Beam
12" Max
Continuous Angle For Tie @ Roof Level
Angle Bracing Designed in Accord With the Code
6" Sq. Plate Washers
Angle Lagged to Roof Joist or Blkg.
Block 3 Rafter Spaces
Nailed Tie Strap
Remove Existing Parapet, Check For Guardrail Requirements
Reinforced Concrete or Masonry Cap and Tie Beam
Intermittent Keys
12" Max

Figure 10
Parapet Bracing Details Use For Cost Study

SOURCE: Kariotis, John, "Strengthening Techniques - Bracing of Masonry Walls and Parapets," Earthquake Hazard Mitigation of Unreinforced Masonry Buildings Buildings Built Prior to 1934, SEAOSC.



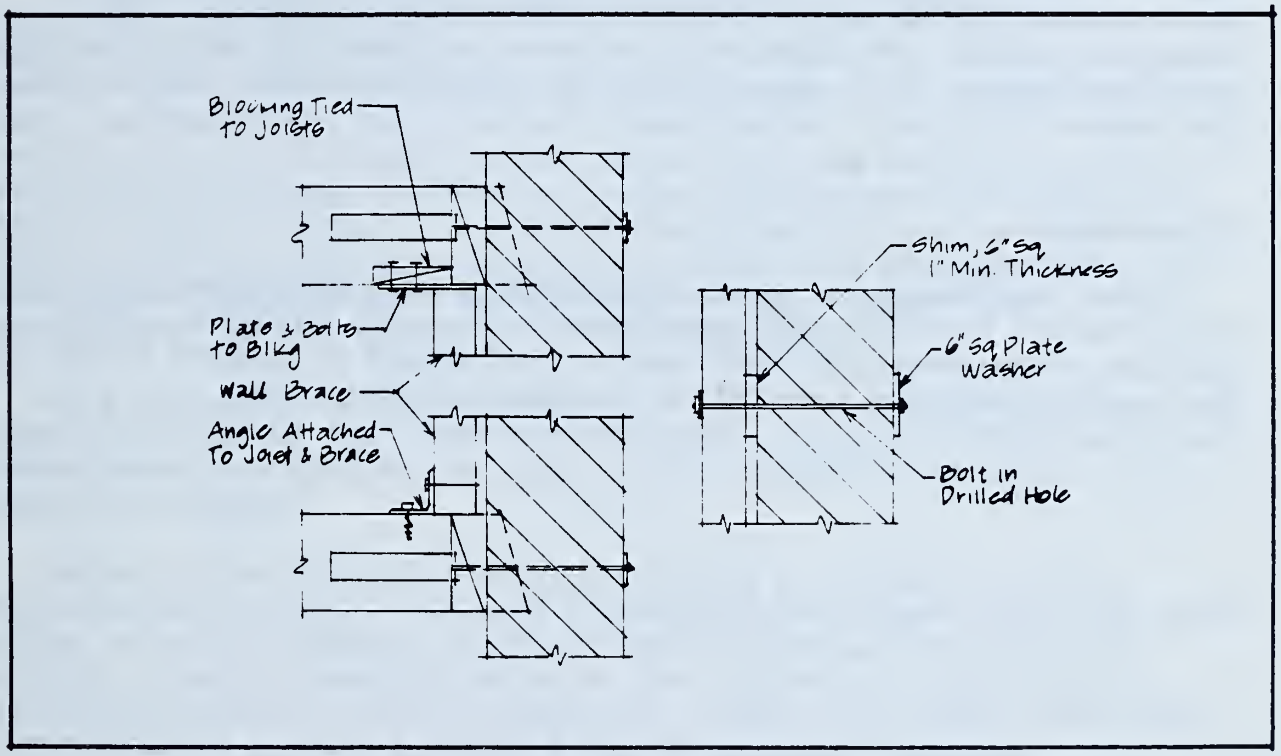


Figure 11
Out-of -Plane Bracing Details Used for Cost Study

SOURCE: Kariotis, John, "Strengthening Techniques - Bracing of Masonry Walls and Parapets," Earthquake Hazard Mitigation of Unreinforced Masonry Buildings Buildings Built Prior to 1934, SEAOSC.

Structure Work:

- vertical steel members (tubing or channel) at 8' o.c. connected to floor or ceiling joist at top and bottom. Through bolts or epoxy embedded bolts at center.

Architectural Work:

- removal of wall, ceiling, and floor finish to expose masonry and floor joists.

- gypsum finish over vertical brace, floor and ceiling.

Reentrant Corner
(Alleviating stress concentration)

L shaped or other eccentric shaped buildings may experience damage at the reentrant corner where the building may have differential movement in an earthquake. In smaller buildings, the legs can be tied together with collectors (usually steel). In larger buildings, a seismic separation may be a good solution. Seismic separation involves cutting away approximately 12" of wall and floor of the entire building at the reentrant corner. New shear wall or braces are provided near or at the cut if necessary. This gap is filled by a metal expansion joint and finished.

Miscellaneous

Other than the above items, miscellaneous work associated with the strengthening tasks are also considered in the cost analysis. This includes strengthening of stair wells, replacement of damaged finish due to construction process, painting of entire interior, etc.

VI. COST ANALYSIS

In preparation for the workshop, typical variations in URM residential buildings were identified. Workshop discussions addressed these variations, associated seismic hazards, and methods commonly used to reduce these hazards. The strengthening scenarios were designed to represent these typical variations and the cost analysis of each scenario then estimated the typical associated costs. Further, these costs were generalized to estimate the approximate costs of individual strengthening techniques.

Lee Saylor and John Robertson, two construction cost estimators, were hired to estimate the costs of the strengthening work. Upon the engineers' completion of the preliminary strengthening designs, each cost estimator analyzed the solutions and estimated the associated costs based on standard construction details similar to those described in the handbook put out by the Structural Engineers Association of California (SEAOC), Earthquake Hazards Mitigation of Unreinforced Masonry Buildings. These figures were checked against actual construction cost data from projects recently completed in Los Angeles.

The differences in cost estimates submitted by the two cost consultants reflect a factor of uncertainty of construction costs associates with the renovating of older buildings. As Table 3 indicates, there are only minor differences in the estimate of the unit structural costs, as these costs are relatively predictable. The uncertain part of the estimates is attributed to the unknown existing conditions, which is reflected in the large differences in the architectural and demolition cost estimates. Further, the unknown conditions are greater for this study as the cost estimator cannot be provided with comprehensive data from on-site investigation, engineering testing, and detailed architectural surveys of the existing conditions.

From the submitted cost estimates, a composite estimate was compiled, generally following the conservative estimate. Data recorded from actual strengthened case studies was also used as a guide in formulating the composite estimate.

Table 1 shows the costs for each scenario as estimated by John Robertson and Lee Saylor, as well as the adjusted figures which are based on the two cost estimators' work and data from actual strengthening projects. Table 2 shows the adjusted cost estimate of each piece of strengthening work for the 14 scenarios. Table 3 shows the generalized cost breakdowns by both estimators and the adjusted estimate.

The variations in design solutions which most dramatically impacted upgrading costs were primarily in response to building characteristics (e.g., height) and strengthening level. These design variations include 1.) size and quantity of braces and additional shear walls; 2.) method of diaphragm strengthening; and 3.) special techniques for addressing problems of configuration (e.g., a "seismic cut" for the L-shaped building). Thus building characteristics and strengthening level impact upgrading designs and, consequently, upgrading costs. For example, the

	BUIL 15,634 T.				BUILDING #5 48,542 SQ. FT.			
	Steel		Concrete		Steel		Concrete	
	$/Sq Ft	Total $	Ft	Total $	$/Sq Ft	Total $	$/Sq Ft	Total $
LEVEL 1 Adjusted Estimate	11.93[2]	186,566						
Robertson Estimate	12.14[2]	189,821						
Saylor Estimate	9.43[2]	147,411						
LEVEL 2 Adjusted Estimate	21.72	339,557					22.97	1,114,814
Robertson Estimate	19.71	308,181					22.69	1,101,409
Saylor Estimate	15.79	246,892					18.45	895,462
LEVEL 3 Adjusted Estimate								
Robertson Estimate								
Saylor Estimate								

Notes:

1. Cost based on bracing on four sides. If o

2. Probably low estimates, based on range app

Table 1
URM Seismic Cost Study Summary

	BUILDING #1 15,634 SQ. FT.				BUILDING #2 15,405 SQ. FT.				BUILDING #3 17,429 SQ. FT.				BUILDING #4 12,230 SQ. FT.				BUILDING #5 48,542 SQ. FT.			
	Steel		Concrete		Steel		Concrete		Steel		Concrete		Steel		Concrete		Steel		Concrete	
	$/Sq Ft	Total $	$/Sq Ft	Total $	$/Sq Ft	Total $	$/Sq Ft	Total $	$/Sq Ft	Total $	$/Sq Ft	Total $	$/Sq Ft	Total $	$/Sq Ft	Total $	$/Sq Ft	Total $	$/Sq Ft	Total $
LEVEL 1 Adjusted Estimate	11.93[2]	186,566	12.45[2]	194,645	15.44	237,906	15.99	246,250	22.33	389,109	20.28	353,505								
Robertson Estimate	12.14[2]	189,821	13.17[2]	205,943	14.37	221,405	15.87	244,405	18.93	329,903	18.79	327,526								
Saylor Estimate	9.43[2]	147,411	9.34[2]	146,081	12.24	188,590	11.92	183,602	18.63	324,725	16.70	291,131								
LEVEL 2 Adjusted Estimate	21.72	339,557			20.34	313,408	22.27	343,039	24.24	422,404	25.21	439,452	26.04[1]	318,502					22.97	1,114,814
Robertson Estimate	19.71	308,181			18.21	280,529	23.00	354,270	20.55	358,129	22.92	399,401	21.42[1]	262,007					22.69	1,101,403
Saylor Estimate	15.79	246,892			16.72	257,600	18.28	281,650	20.16	351,425	20.87	363,718	22.05[1]	269,664					18.45	895,462
LEVEL 3 Adjusted Estimate							38.16	587,866												
Robertson Estimate							36.79	566,701												
Saylor Estimate							30.26	466,095												

Notes:

1. Cost based on bracing on four sides. If only the two open sides are braced, the cost would be approximately $4.00/sq.ft. less.
2. Probably low estimates, based on range approximation of material quantity.

Table 1
URM Seismic Cost Study Summary

	Steel		oncrete	BUILDING #5 48,542 SQ. FT. Steal		Concrete	
	$/Sq Ft	Tota $	Total $	$/Sq Ft	Total $	$/Sq Ft	Total $
LEVEL 1							
Seismic Cut	.00						
Anchorage System	3.05	47,					
Parapet Bracing	1.21	18,					
Out of Plane	.58	9,					
Diaphraphms	4.09	63,					
Transvarse Shear Walls	2.58	40,					
Longitudinal Shear walls	.00						
TOTAL*	11.93	$186,5					
LEVEL 2							
Seismic Cut	.00					1.56	75,530
Anchorage System	3.05	47,6				4.17	202,210
Parapet Bracing	1.21	18,9				.61	29,700
Out of Plana	.58	9,1				.00	0
Diaphraphms	4.46	69,7				2.74	133,014
Transvarse Shear Walls	11.63	181,7				7.27	353,088
Longitudinal Shear walls	.00					6.62	321,273
TOTAL*	21.72	$339,5				22.97	1,114,814
LEVEL 3							
Seismic Cut							
Anchorage System							
Parapet Bracing							
Out of Plane							
Diaphraphms							
Transvarse Shear Walls							
Longitudinal Shear walls							
TOTAL*							

Table 2
Adjusted Cost Estimates for Strenghening Work

	BUILDING #1 15,634 SQ. FT.				BUILDING #2 15,405 SQ. FT.				BUILDING #3 17,429 SQ. FT.				BUILDING #4 12,230 SQ. FT.				BUILDING #5 48,542 SQ. FT.			
	Steel		Concrete		Steel		Concrete		Steel		Concrete		Steel		Concrete		Steel		Concrete	
	$/Sq Ft	Total $	$/Sq Ft	Total $	$/Sq Ft	Total $	$/Sq Ft	Total $	$/Sq Ft	Total $	$/Sq Ft	Total $	$/Sq Ft	Total $	$/Sq Ft	Total $	$/Sq Ft	Total $	$/Sq Ft	Total $
LEVEL 1																				
Seismic Cut	.00	0	.00	0	00.	0	.00	0	.00	0	.00	0								
Anchorage System	3.05	47,644	3.05	47,644	5.50	84,762	5.50	84,762	5.57	98,889	5.67	98,889								
Parapet Bracing	1.21	18,920	1.21	18,920	1.09	16,720	1.09	16,720	.64	11,220	.64	11,220								
Out of Plane	.58	9,116	.58	9,116	.52	8,056	.52	8,056	.00	0	.00	0								
Diaphraphms	4.09	63,915	4.09	63,915	1.97	30,308	1.97	30,308	5.25	91,480	5.25	91,480								
Transverse Shear Walls	2.58	40,381	3.08	48,150	5.80	89,285	6.34	97,713	5.32	92,750	6.46	112,595								
Longitudinal Shear walls	.00	0	.00	0	.00	0	.00	0	4.65	81,125	1,57	27,434								
TOTAL*	11.93	$186,566	12.45	$194,645	15.44	$237,906	15.99	$246,250	22.33	$389,109	20.28	$353,505								
LEVEL 2																				
Seismic Cut	.00	0			.00	0	.00	0	.00	0	.00	0	.00	0					1.56	75,530
Anchorage System	3.05	47,644			5.50	84,762	5.50	84,762	5.67	98,889	5.67	98,889	5.82	71,189					4.17	202,210
Parapet Bracing	1.21	18,920			1.09	16,720	1.09	16,720	.64	11,220	.64	11,220	.00	0					.61	29,700
Out of Plane	.58	9,116			.52	8,056	.52	8,056	.00	0	.00	0	.00	0					.00	0
Diaphraphms	4.46	69,739			1.97	30,308	1.97	30,308	5.25	91,480	5.25	91,480	7.53	92,058					2.74	133,014
Transverse Shear Walls	11.63	181,759			9.45	145,554	12.36	190,375	6.41	111,600	10.15	176,983	5.84	71,412					7.27	353,088
Longitudinal Shear walls	.00	0			1.06	16,376	.00	0	5.41	94,300	2.63	45,875	5.95	72,810					6.62	321,273
TOTAL*	21.72	$329,557			20.34	$313,408	22.27	$343,039	24.24	$422,404	25.21	$439,452	26.04	$318,502					22.97	1,114,914
LEVEL 3																				
Seismic Cut							.00	0												
Anchorage System							5.50	84,762												
Parapet Bracing							1.09	16,720												
Out of Plane							.00	0												
Diaphraphms							4.96	76,458												
Transverse Shear Walls							12.40	191,026												
Longitudinal Shear walls							12.86	198,185												
TOTAL*							38.16	$587,866												

Table 2
Adjusted Cost Estimates for Strengthening Work

	John Robertson	Lee Saylor	proposed figure	Units*
1. Anchorage, Shear Bolt, Chords:				
Structural	$55.00	$45.47	$55.00	LF
Architectural	$14.25	$7.10	$14.25	LF
2. Diaphragm Strengthening:				
structural				
a. plywood - floor	$2.10	$2.60	$2.60	SF
b. plywood - roof	$2.10	$2.03	$2.10	SF
c. strapping - 2" x 16 GA	$3.00	$2.50	$2.50	LF
d. horizontal steel truss	$2.00	$3.25	$3.25	LB
architect, demolition & refinish				
a. floor	$2.00	$3.25	$3.00	SF
b. roof	$4.10	$3.25	$3.25	SF
c. steel truss			25%	
3. Transverse Shear Element:				
structural				
a. concrete grade beams	$500.00	$650.00	$650.00	CY
b. concrete foundation mat or pier		$550.00	$550.00	CY
c. concrete column & pilaster	$650.00	$750.00	$750.00	CY
d. concrete pilaster	$400.00	$750.00	$650.00	CY
e. concrete girder	$700.00	$750.00	$750.00	CY
f. concrete shear wall		$625.00	$700.00	CY
g. gunite shear wall	$650.00	$750.00	$700.00	CY
h. structural steel	**$2.00	$3.10	$3.10	LB
architectural, demolition & refinish				
a. concrete foundation		13%	25%	
b. concrete shear wall	ave. 50%	25%	50%	
c. concrete frame	ave. 41%	13%	25%	
d. steel brace	ave. 49%	10%	25%	

	John Robertson	Lee Saylor	Proposed Figure	Units*
4. Longitudinal Shear Element				
structural				
a. concrete grade beams	$500.00	$650.00	$650.00	CY
b. concrete foundation mat or pier		$550.00	$550.00	CY
c. concrete column & pilaster	$650.00	$750.00	$750.00	CY
d. concrete pilaster	$400.00	$750.00	$650.00	CY
e. concrete girder	$700.00	$750.00	$750.00	CY
f. concrete shear wall		$625.00	$700.00	CY
g. gunite shear wall	$650.00	$750.00	$700.00	CY
h. structural steel	$2.00	$3.10	$3.10	LB
architectural, demolition & refinish				
a. concrete foundation		13%	25%	
b. concrete shear wall	ave. 50%	25%	50%	
c. concrete frame	ave. 41%	13%	25%	
d. steel brace	ave. 49%	10%	25%	
5. Parapet Bracing:				
structural	$120.00	$23.60	$55.00	LF
6. Out of Plane Bracing:				
structural	$?	$19.22	$20.00	LF
architectural	$?	$6.50	$6.50	LF
7. Seismic Cut:				
structural	$65.84	$52.00	$66.00	LF
architectural	$50.00	$41.00	$50.00	LF
8. Miscellaneous				
overall architectural	5%		5%	

* LF: Linear Foot
SF: Square Foot
LB: Pound
CY: Cubic Yard
%: % of Structural Cost

**Cost based on amount needed for fabrication.

Table 3
Unit Cost Summary

costs associated with building height and strengthening level can be seen by comparing Buildings #1, 2 and 3, all of basic configuration but varying in height. While the cost per square foot of a wall anchorage system remains constant, the costs associated with seismic strengthening to levels 1 and 2 increase with building height. (See Table 4.)

Cost Per Square Foot ($)

	Wall Anchorage	Level 1	Level 2
Bldg. #1 (2 Stories)	6	13	21
Bldg. #2 (4 Stories)	6	16	23
Bldg. #3 (6 Stories)	6	21	25

Table 4
Approximate Costs of Seismic Strengthening

From the accumulated data, individual prototypical buldings can be analyzed in terms of the different levels of upgrading. Further, cost comparisons can be made on the basis of strengthening method, building height, and configuration.

Most Common San Francisco Building

For prototype Building #2, the costs for seismic upgrading range from approximately $6 per square foot for a wall anchorage system to over $35 per square foot for a solution which would bring the building to current Uniform Building Code standards. This 4-story rectangular building represents the most common type of residential building in San Francisco in terms of physical characteristics. The building used for prototype #2 has a high (15 foot) first story with an open front. Further, it has a poor aspect ratio (i.e., it is very long and narrow). These charac teristics influence the costs of all the upgrading solutions, but in particular the costs of the "minimum upgrade". To ensure stability, the minimum upgrade of Building #2 must go beyond the most basic steps of wall anchorage and parapet bracing to include three rows of bracing, at the front of the building and at the indentation lines, at least on the ground floor. This solution assumes that the partitions above will act to support the upper stories[3].

---

[3] In some buildings, it is possible that a wall anchorage system will bring the building to the minimum acceptable standard as outlined by the workshop participants. This minimum is a function of the length of floor spans, number and type of openings, and building configuration.

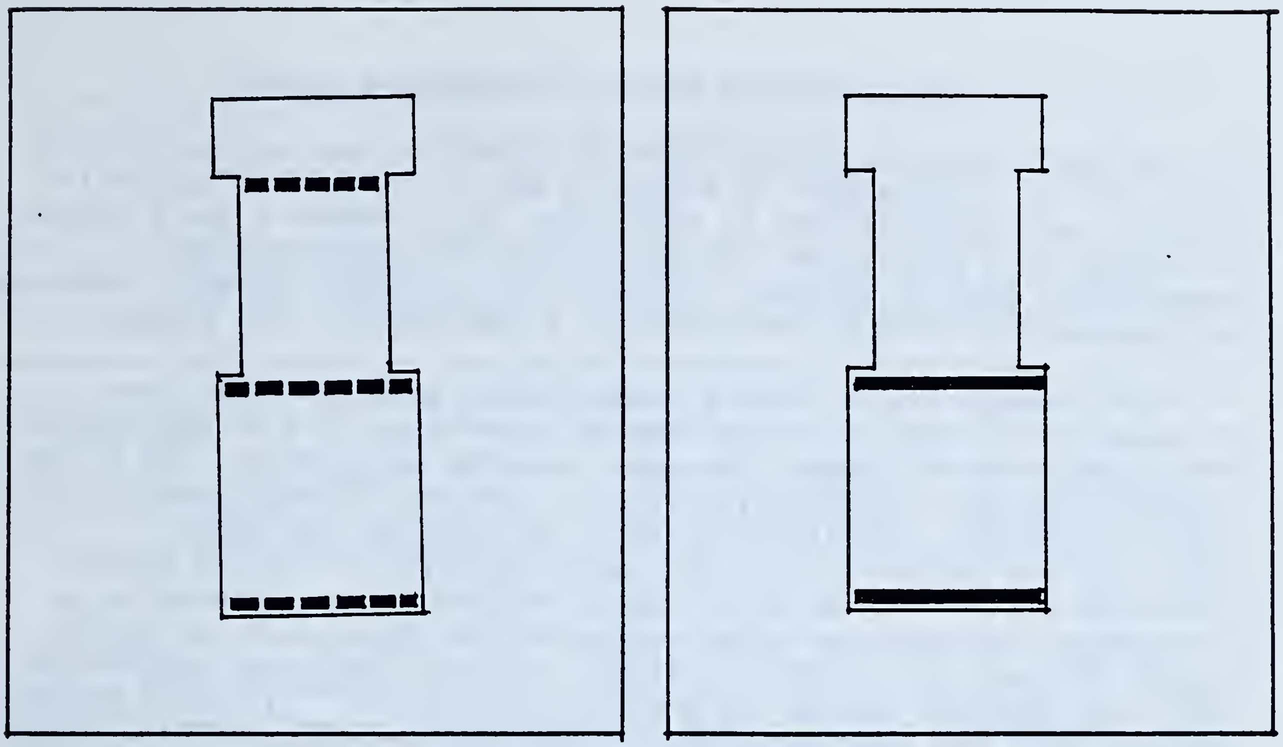
A level 1 upgrade of Building #2 includes two rows of transverse bracing and minimal longitudinal bracing. A level 2 upgrade includes a third row of bracing. When strengthening Building #2 to level 3, substantial reinforcement of longitudinal walls is needed in addition to the transverse bracing. (See Figure 12.) Further raising the costs is the necessity of horizontal trusses to alleviate diaphragm stresses as opposed to plywood sheathing. As would be expected, costs rise with strengthening level, with the largest jump being from level 2 to 3. (See Table 5.)

Building #2 Upgrade Cost	Per Square Foot ($)
Wall Anchorage System	$ 6.00
"Minimum Upgrade"	$10.40 (a)
Level 1	$15.40 (b)
Level 2	$20.30 (b)
Level 3	$38.20 (c)

(a) Approximate cost extrapolated from scenario #5.
(b) Steel solution.
(c) Concrete solution.

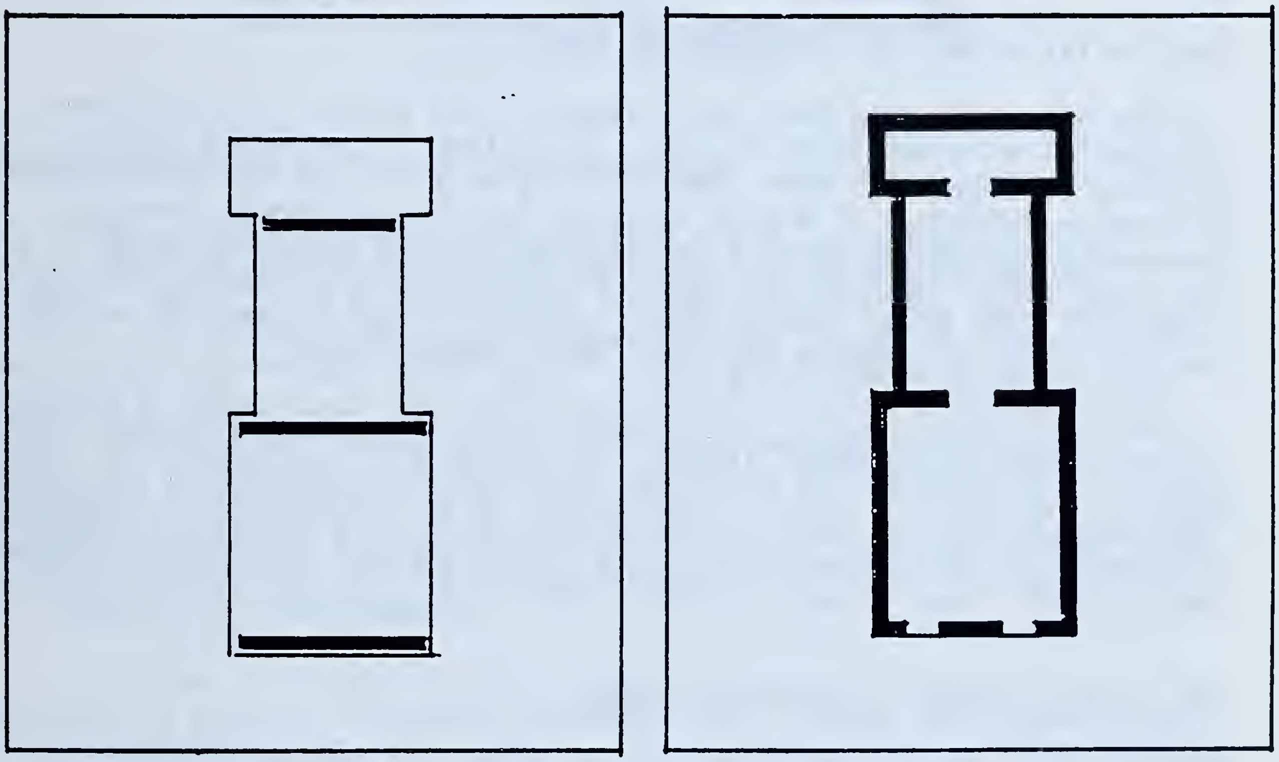
Table 5
Costs of Upgrading for Prototypical Building

The other scenarios represent variations of this basic building and as such the costs reflect the associated range. The major cost differences reflect the building characteristics of height and configuration, and strengthening level. For example, when all other factors are held constant, the price jump for the concrete solution at Level 1 associated with a building height increase from four to six stories is $4.30 per square foot. Secondary cost differences reflect building specific characteristics, such as aspect ratio, location in the block, and the type and number of openings. The minimum upgrade of Building #2 illustrates this, as it could possibly have been achieved through a wall anchorage system alone were it not for its poor aspect ratio and high first story with an open front. In sum, building height and configuration influence patterns of major cost variations, while individual building characteristics will have a secondary impact and can affect the general pattern.



"Minimum Upgrade":
3 Rows of Transverse Bracing
at Ground Level

Level 1:
2 Rows of Tranverse Bracing,
Minimal Longitudinal Bracing



Level 2:
3 Rows of Transverse Bracing,
Minimal Longitudinal Bracing

Level 3:
3 Rows of Tranverse Bracing,
Longitudinal Bracing

Figure 12
Bracing Schematics for Building #2

Cost Variation Due To Strengthening Method

The cost variation between the steel brace method and the concrete shear wall or frame method is generally small. A concrete system is slightly more expensive due to high labor cost. However, the difference in cost is only associated with the cost of the transverse and longitudinal bracing system. The costs for anchorage, parapet, diaphragm etc. are not affected by the choice of a concrete or steel system.

For strength levels 1 and 2, longitudinal bracing in the basic rectangular building is very minimal. Therefore, since often only the transverse brace is added, the cost variation only affects 30% to 50% of the total seismic strengthening costs. In higher strength levels and in taller buildings, the steel system is potentially less expensive, but not substantially. The small variation in cost is easily offset by the difference in individual bracing design. Since the differences in steel configurations are broad, their cost can easily exceed the cost of a concrete system. The cost comparison between the steel and concrete systems are presented in Table 6. It should be noted, however, that this cost data does not reflect the substantially shorter construction time associated with a steel system.

Cost Variation Due to Strengthening Level

The data indicates that the strength level affects the cost more substantially in Buildings #1 & 2. This effect is probably due to building configuration more than building height. The substantial jump in cost in Buildings #1 & 2 is probably for the additional line of transverse bracing at level 2 in response to high diaphragm stress. On the other hand, the more stringent strengthening requirements did not affect Building #3 as dramatically. The added requirement did not call for more lines of bracing but just larger member sizes.

One can clearly see a large jump in cost associated with the level 3 strengthening requirement. (Level 3 corresponds to current UBC.) The dramatic increase in cost is due to the need to substantially reinforce longitudinal walls as well as transverse walls. Furthermore, diaphragm strengthening with plywood sheathing cannot achieve sufficient strength and stiffness; more expensive horizontal steel trusses must be used.

Cost Variation Due to Building Height

The cost of seismic work generally increases with building height. Table 6 shows that at level 1, Building #3 is substantially higher in cost than Building #1 and #2. This is probably mainly attributed to the fact that Building #3 has 2 lines of longitudinal bracing as well as 2 lines of transverse bracing, where Buildings #1 and #2 have only two lines of transverse bracing. The cost difference again is due to the number of braces rather than the size of braces. The level 2 cost relationships between Buildings #1, 2, 3 are more indicative of the cost variation due to height as Building #1 & #2 are strengthened with 3 lines of bracing.

	Cost Per Square Foot ($)			
	Level 1	Level 2	Level 3	
Bldg. #1 (2 stories)	11.90 *	21.70	-------	Steel
	12.50 *	------	-------	Concrete
Bldg. #2 (4 stories)	15.40	20.30	-------	Steel
	16.00	22.30	28.20	Concrete
Bldg. #3 (6 Stories)	22.30	24.20	-------	Steel
	20.30	25.30	-------	Concrete

* probably low estimates, based on rough approximation of material quantity.

Table 6
Cost as a Function of Strengthening Method
and Building Height

Cost Variation Due to Building Configuration

Building configuration clearly has an effect on reconstruction cost. In basic rectangular buildings, the general strengthening includes 2 or 3 lines of transverse bracing with minimal longitudinal bracing. In small buildings with square plans, it may be necessary to substantially strengthen both longtitudinal and transverse walls, thus incurring a higher cost. In corner buildings, torsional problems may occur. Although the building code has rules against torsional situations, a specific method for strengthening is not prescribed. With the recognition that torsion is a problem in corner Building #4, the cost estimate is based on a solution with four lines of bracing, one at each perimeter wall. The cost of $26.00 per sq.ft. reflects this additional strengthening requirement.[4]

In L-shaped buildings or buildings with reentrant corners, it may be necessary to provide a seismic separation cut. Again, this is an item not specifically required by code but is the method chosen in the upgrade of Building #5 to address the problems associated with this configuration. This work will of course drive the cost of retrofit up.

---

[4] This cost is based on bracing on four sides, if only the two open sides are braced, the cost can be reduced $4.00 per square foot.

Cost Per Square Foot ($)		
Building Configuration		
Basic (a)	Corner (b)	L-Shapeed (c)
20.30	26.10	30.00

(a) Building #2
(b) Buidling #3
(c) Building #5

Table 7
Cost as a Function of
Building Configuration:
Steel Solution, Level 2

Buildings with small footprints may be more expensive to retrofit on a square foot basis than larger buildings because smaller buildings have a higher wall to floor area ratio. In other words the same amount of floor area in a small building is associated with more wall area, and the wall is the part of the building likely to require the most seismic upgrading. Further, buildings with fewer rooms generally have a higher cost per room. This is for the above reason, as well as the fact that in renovation projects there is a cost associated with all projects regard less of size, and the more rooms that a building has, the smaller the cost will be per room.

Comparison with Other Studies and Real Construction Data

To further evaluate the data accumulated from the workshop, the post-workshop cost estimates were compared to other studies and actual construction data. The primary source of comparable data is associated with seismic retrofit ordinances that have been enacted in the Los Angeles area. In general, these studies and actual construction data show lower costs for seismic upgrading work than do the workshop estimates. This is due to a number of factors, including 1.) the use of pre-1986 dollars; 2.) lack of accounting for architectural and other associated costs; 3.) different building characteristics in Los Angeles (e.g., buildings not built to property lines generally are less expensive to retrofit); 4.) the upgrading techniques accepted in Los Angeles (e.g., interior partitions are allowable for shear resistance); and 5.) the use of "worst case" scenarios for the workshop.

Brief descriptions of the four studies/data sets used for comparison follow:

- Wheeler & Gray Consulting Engineers performed one cost study in May of 1980, before the implementation of the City of Los Angeles' Seismic Upgrading Ordinace. From the buildings studied, the average structural cost was reported to be, in April 1980 dollars, $7,87 per square foot. This cost, however, does not include architectural demolition and refinish. Thus the reported cost of $7.87 per square foot is quite low. (See Table 8.)

- Raymond Steinberg & Associates conducted a cost study again in the Los Angeles area in 1983 based on the same standards. Based on 15 buildings reported, the average structural cost, omitting extreme values, is approximately $7.50 per square foot. Again it must be emphasized that this cost is based on pre-1983 dollars and does not include architectural items. (See Table 9.)

- According to Christine Platt & Robin Shepherd, in their article "Some Cost Considerations of Seismic Strengthening of Pre-code Buildings," the average unit cost for seismic upgrading in Long Beach is reported to be approximately $15 per square foot. Long Beach's ordinance is more stringent, correla ting with strengthening level 2 of the post-workshop cost study.

- The City of Los Angeles, Housing Division, Community Development department reported costs for seismic retrofit to be approximately $7.00 per square foot. this is an average value of 21 buildings during or before 1986. (See Table 10.)

In comparison with this cost analysis, the data from the Los Angeles sources is low. This discrepancy is partly due to the method of strengthening. Since the Los Angeles ordinance allows shear resistance values for existing interior partitions and allows new plywood partitions to be used for shear walls, the cost of the transverse and longitudinal bracing is substantially reduced. In addition, because partitions are used for shear resistance, diaphragm strengthening can also be reduced. In total, this can reduce the structural cost up to $6.00 per square foot. Under most other seismic retrofit ordinances, the above strengthening method is not allowed. The Long Beach ordinance is typical and their average cost of $15 per square foot compares favorably with this cost analysis.

As a whole, this cost study is a slightly high estimate of the average case seismic strengthening cost. This is mainly due to the fact that the costs are based on buildings with poor existing conditions. For example, this study assumes the existing diaphragm to be of straight sheathing, the worst possible case. The resulting estimate is therefore conservative; the actual average cost may be $2-$3 per square foot less. The cost is also based on conservative engineering design which provides for necessary strengthening work not specifically required by code, such as bracing the building against torsional effects and providing a seismic separation for L-shaped buildings, etc. The cost is thus based on code intention rather than code minimum.

Description	No. of Stories	Construction Cost[a]		Project Cost[b]	
		Total	Per Sq.Ft.	Total	Per Sq.Ft.
Apartment 33,4000 Sq. Ft.	4	$190,000	$5.67	$208,000	$6.22
Apartment and Industrial 17,2000 Sq. Ft.	3	$189,000	$11.02	$207,000	$12.08
Warehouse 6,4000 Sq. Ft.	1	$50,400	$7.90	$55,600	$8.70
Industrial	1 + mez.	$78,300	$7.15	$86,500	$10.60
Commercial	2	$135,000	$9.66	$148,000	$10.60
Average		$129,000	$7.87	$141,000	$8.60

Note: [a] Includes Contractor's Profit, Overhead and other contingencies.
[b] Includes Engineering, Testing and Building Permit Fees. (based on April 1980 dollars from Wheeler and Gray report.

Table 8
Summary of Wheeler and Gray Cost Study*

*Based on Wheeler and Gray, Consulting Engineers, Costs Study Report for Structural Strengthening Using Proposed Division 68 Standards, Los Angeles City Council Action C.F. No. 79-4244, May 1980, in an article by Christing M. Platt and Robin Shepherd, "Some Cost Considerations of the Seismic Strengtheing of Pre-Code Buildings," EERI Earthquake Spectra Magazine, Vol. 1, No. 4, Aug. 1985, page 699.

Building Address	Building Size (Sq.Ft.)	Number of Stories	Total Cost (Dollars)	Unit Cost ($/Sq.Ft.)	Notes
3923 W. 6th St.	31,400	4	$219,800	7.00	a
108-116 N. San Pedro	30,830	3	$107,450	3.47*	b,c
3745 Grand	21,600	4	$151,200	7.00	d
331-355 E. First St.	15,450	3	$112,100	7.26	b
1475 W. Adams	15,000	3	$103,950	6.93	
325-329 E. First St.	14,100	3	$105,800	7.50	b
341-345 E. First St.	13,790	4	$97,000	7.03	b
6379 Van Nuys Blvd.	12,000	2	$62,040	5.17	
347-353 First St.	11,407	3	$102,000	8.94	b,e
8560-3566 W. Pico	10,450	1	$51,940	4.97*	f
321-323 First St.	9,810	2	$90,000	9.17	b
309-313 First St.	9,035	2	$76,100	8.42	b
337-339 E. First St.	8,100	2	$90,000	11.11	b
303-307 E. First St.	3,250	1	27,000	8.44	b
106 N. San Pedro	1,872	1	$47,00	25.50*	b
	SUM = 208,194		SUM $1,444,080	7.0 = AVERAGE	

Table 9
Los Angeles Seismic Strengthening Cost Study
(Raymond E. Steinberg)

Notes:

a. Long, narrow four story office building which required ne interior plywood shear walls
b. Community Redevelopment Agency (CRA) study with no plans drawn or bids taken.
c. Large, regularly-shaped building with many existing interior partitions.
d. Contact was not awarded but estimate was based upon bids.
e. Height/thickness ratio of walls at top floor was excessive and wall required bracing. There was also illegal addition at the rear.
f. Owner was contractor for a portion of the work.

Based on Steinberg, R., Typical Cost Data for Compliance with Division 68, SEAOSC Seminar Notes, March 8, 1983, in Platt and Shepherd, ibid, p. 698.

Project Number	Total Sq.Ft.	Total Units	Total Rehab Value	Seismic Cost	Seismic Cost/Sqft	Other Rehab Cost	Total Cost/Sqft
1/2.	------	71	1,800,000	600,000		1,200,000	
3.	------	74	1,015,000	324,000		691,000	
4.	------	59	292,752	413,000		(120,248)	
5.	38,353	68	912,234	346,360	9.03	565,874	23.79
6.	------	40	857,940	325,745		532,195	
7.	------	59	746,830	191,970		554,860	
8.	28,280	44	568,080	91,200	3.22	476,880	20.09
9.	------	48	610,560	145,000		402,980	
10.	28,212	40	508,800	103,160	3.66	349,140	18.03
11/12.	64,081	71	1,018,201	231,290	3.61	686,261	15.89
13.	26,600	48	891,000	131,619	4.95	759,381	33.50
14.	21,750	47	1,089,000	203,934	9.38	885,006	50.07
15.	23,000	48	777,000	130,447	5.67	646,553	33.78
16.	22,800	40	775,000	126,478	5.55	648,522	33.99
17.	18,640	32	578,000	114,746	6.16	463,256	31.01
18.	------	18	267,000	87,886		179,114	
19.	26,168	47	650,000	172,000	6.57	478,000	24.84
20.	28,472	48	438,000	203,000	7.13	235,000	15.38
21.	21,680	32	474,000	137,000	6.32	337,000	21.86
22.	40,800	71	640,000	369,590	9.06	270,410	15.69
23.	26,531	41	627,000	212,500	8.01	414,500	23.63
24.	15,735	27	406,000	116,902	7.43	289,098	25.80
25.	16,254	12	185,725	139,395	8.58	46,330	11.43
26.	20,640	32	300,000	152,200	7.37	147,800	14.53
27.	20,106	28	398,396	216,096	10.75	182,300	19.81

Table 10

Housing Division Community Development Department
City Of Los Angeles
December 1986

Summary of Costs for Rehabilitation
of Seismic Deficient Buildings
Assisted by City Funding

SUPPLEMENTAL INFORMATION

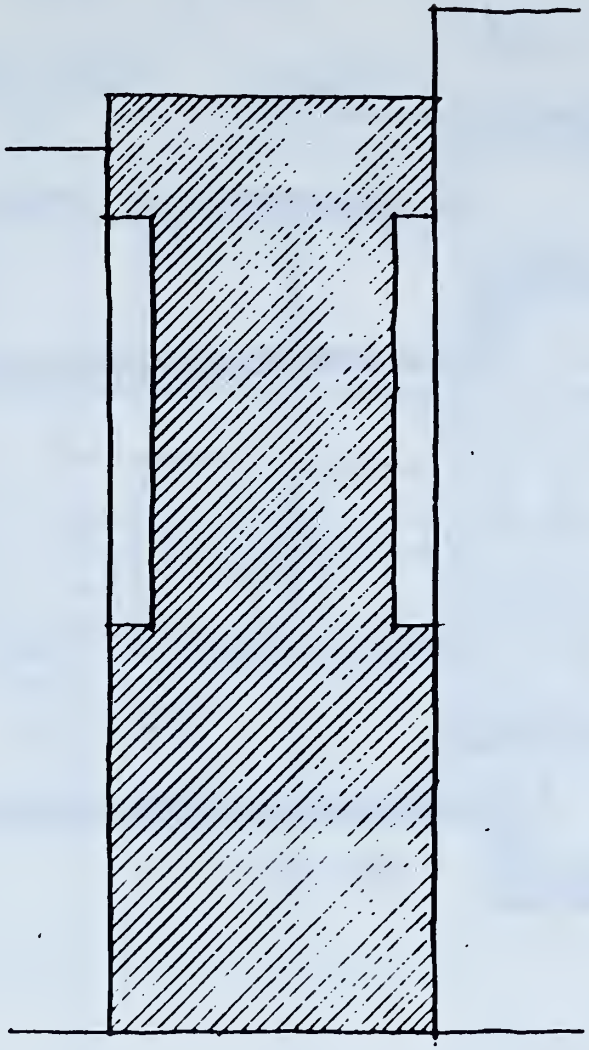
a. typical design example
b. drawings of buidlings
c. synopsis of major earthquake codes
d. detailed cost breakdown
    1. adjusted cost estimates
    2. scenarios 1-16 by Lee Saylor
    3. scenarios 1-16 by John Robertson

a: typical design example

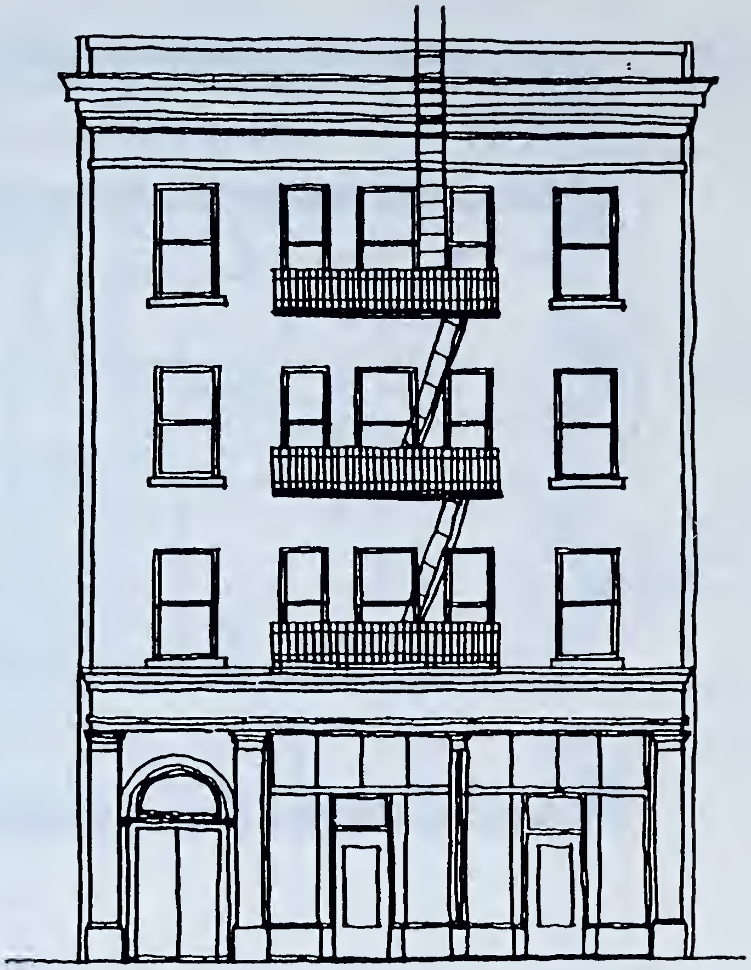
Scenario #7

Strengthening Level 2
Steel Solution

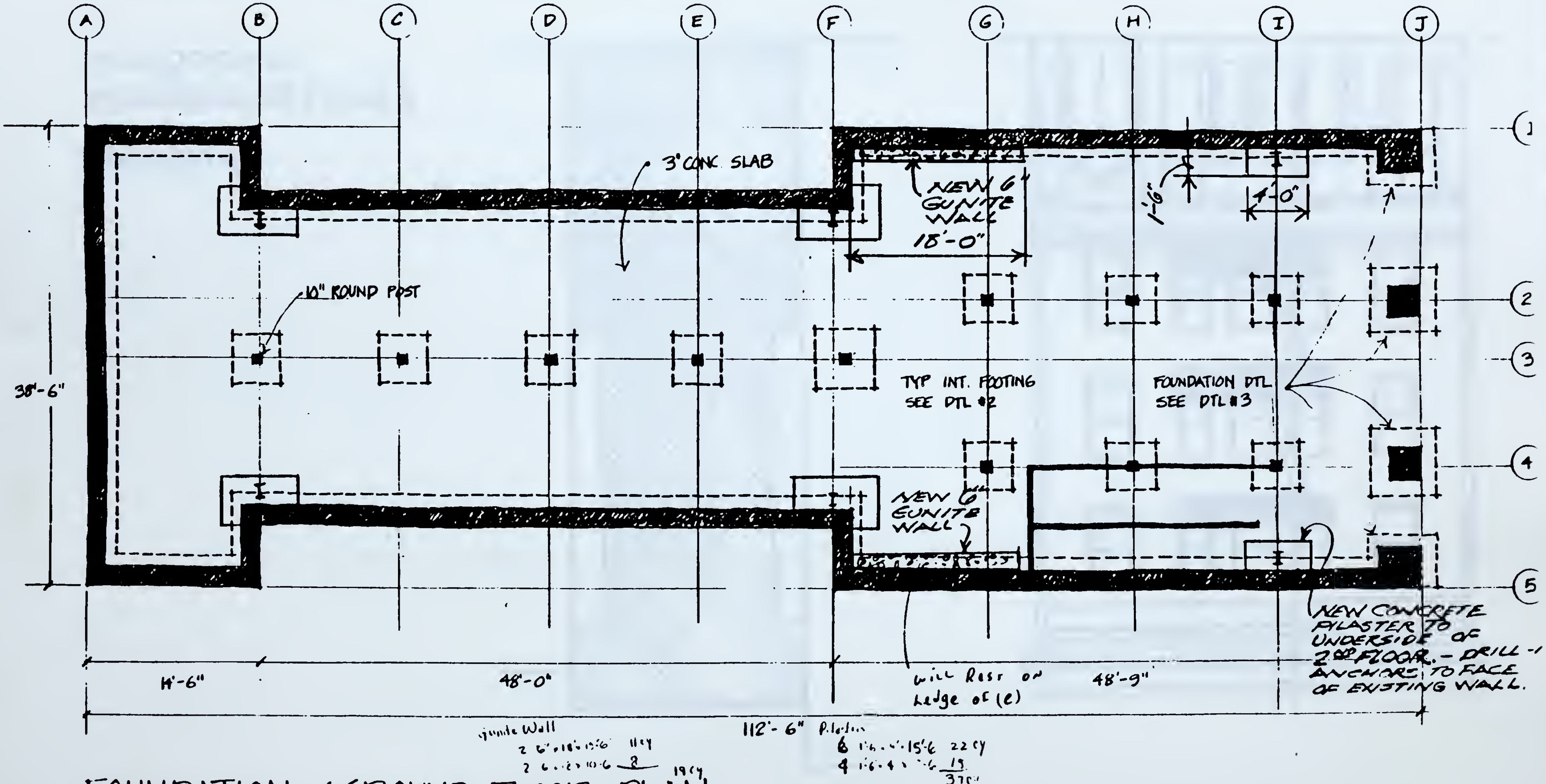
BUILDING #2



ADJACENT BLDG DIAGRAM

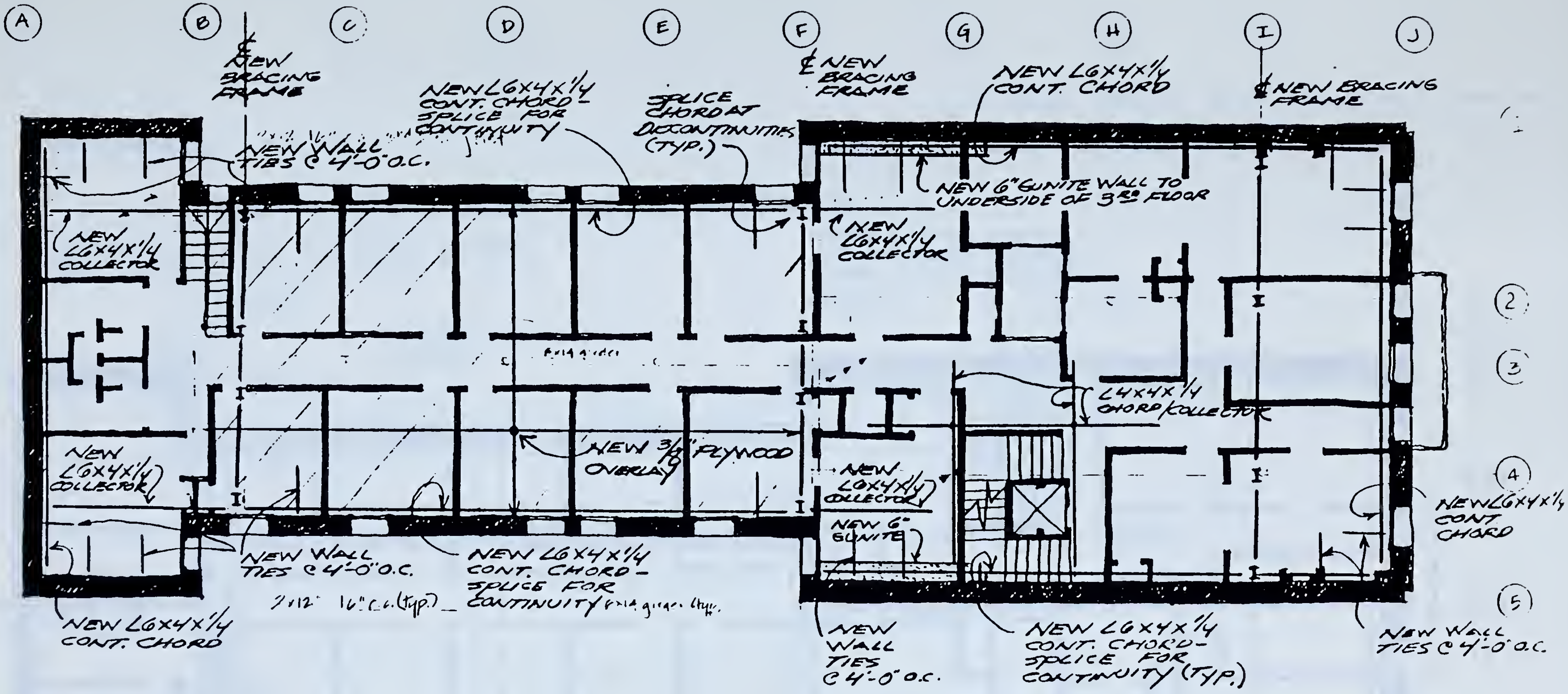


FRONT ELEVATION



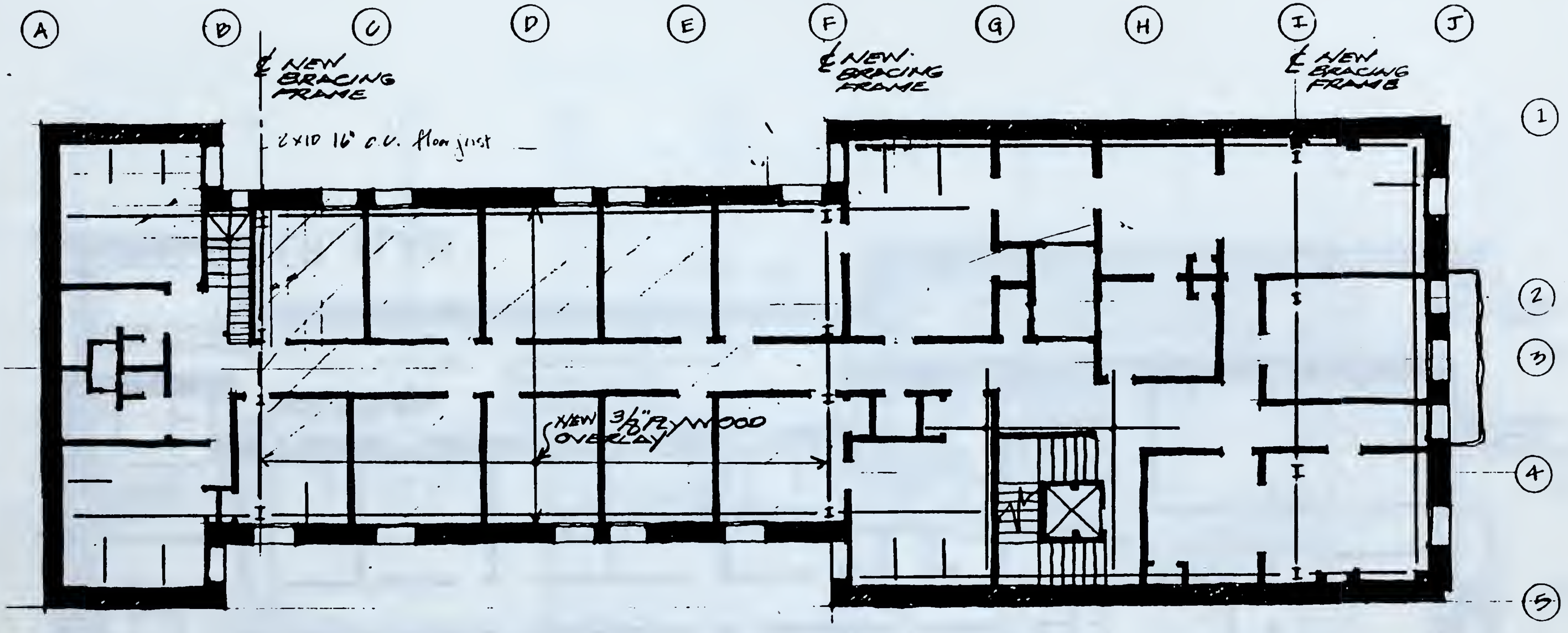
FOUNDATION / GROUND FLOOR PLAN

Scenario #7



SECOND FLOOR PLAN

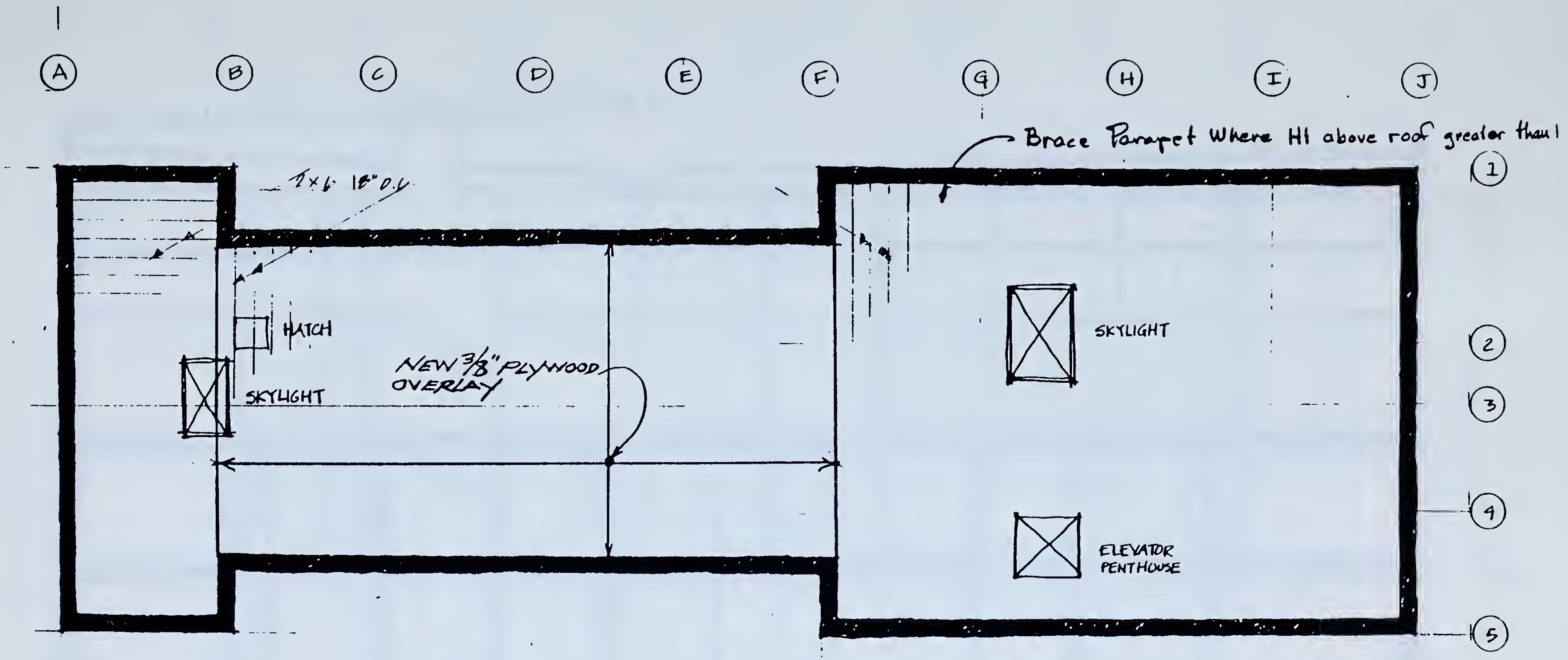
Scenario #7



THIRD/FOURTH FLOOR PLAN

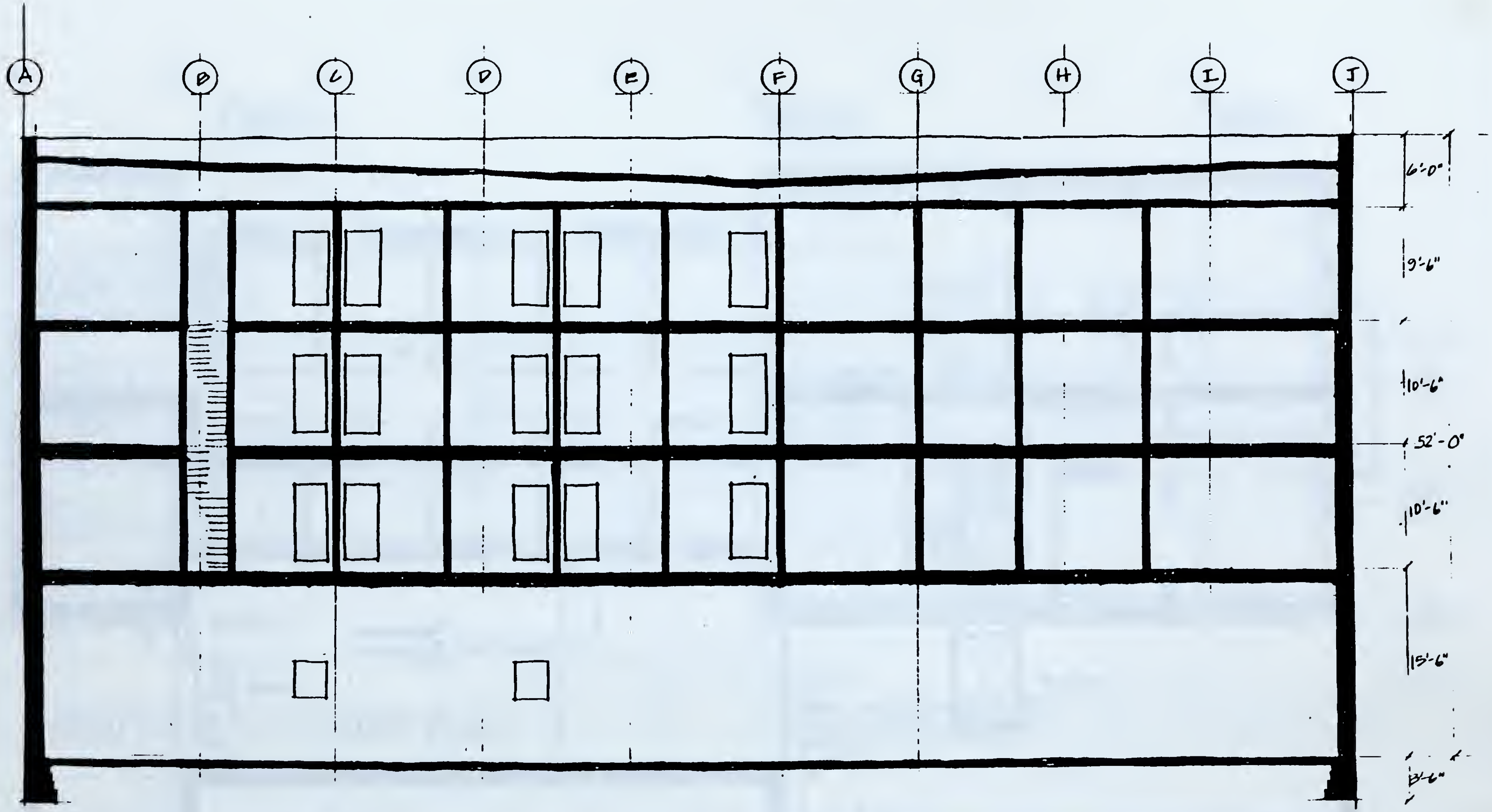
NOTE
SEE SECOND FLOOR
PLAN FOR CHORDS
AND WALL TIES.

Scenario #7



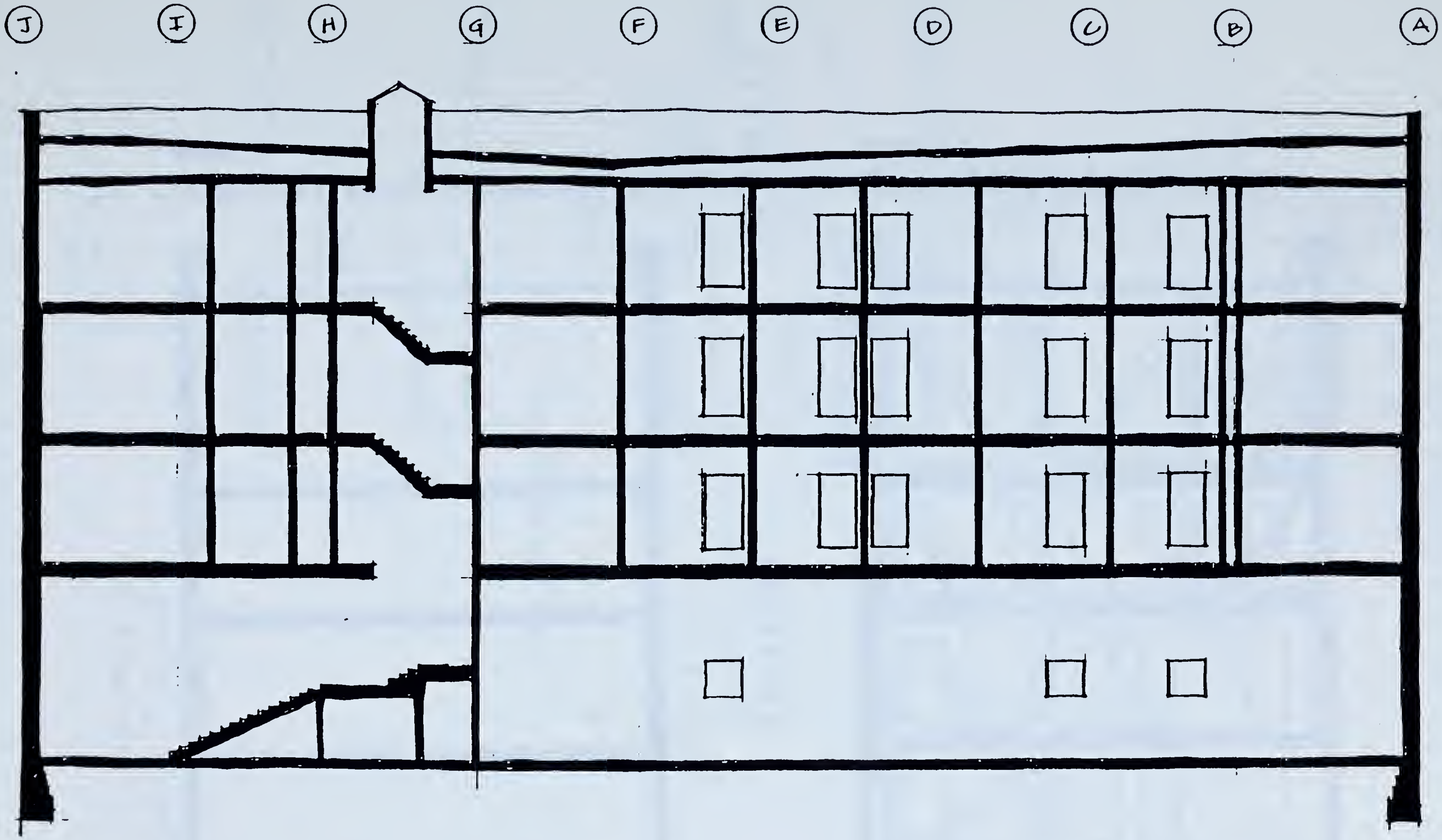
ROOF PLAN

Scenario #7



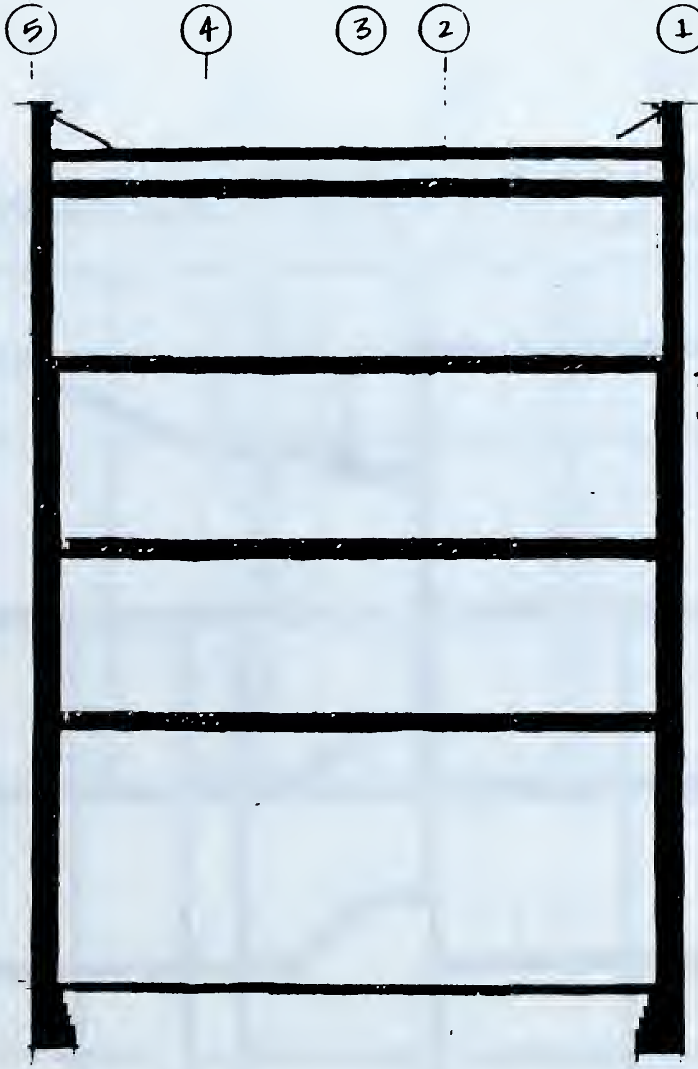
EAST INTERIOR ELEVATION @ LINE 1

Scenario #7



WEST INTERIOR ELEVATION @LINE 7

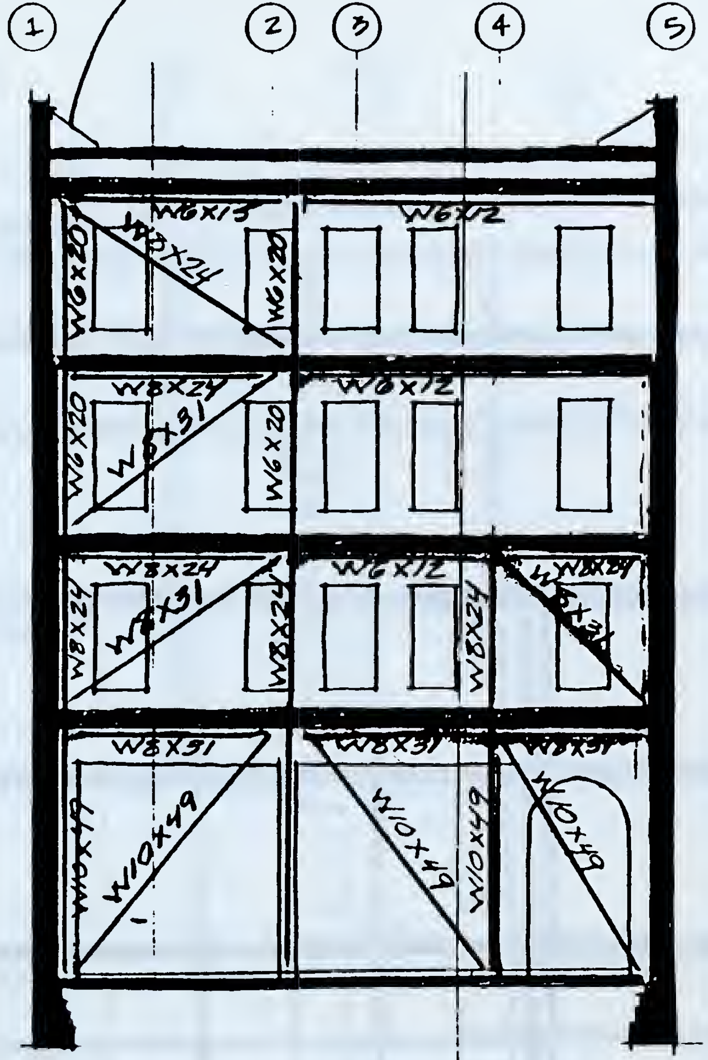
Scenario #7



NORTH INTERIOR ELEVATION
@ LINE A

B&F
2x
W10x49 - 78 - 3822
8x31 - 56 1736
8x24 - 36 864
6x20 - 40 800
6x12 - 30 360
6x15 - 10 150
7732
15464#

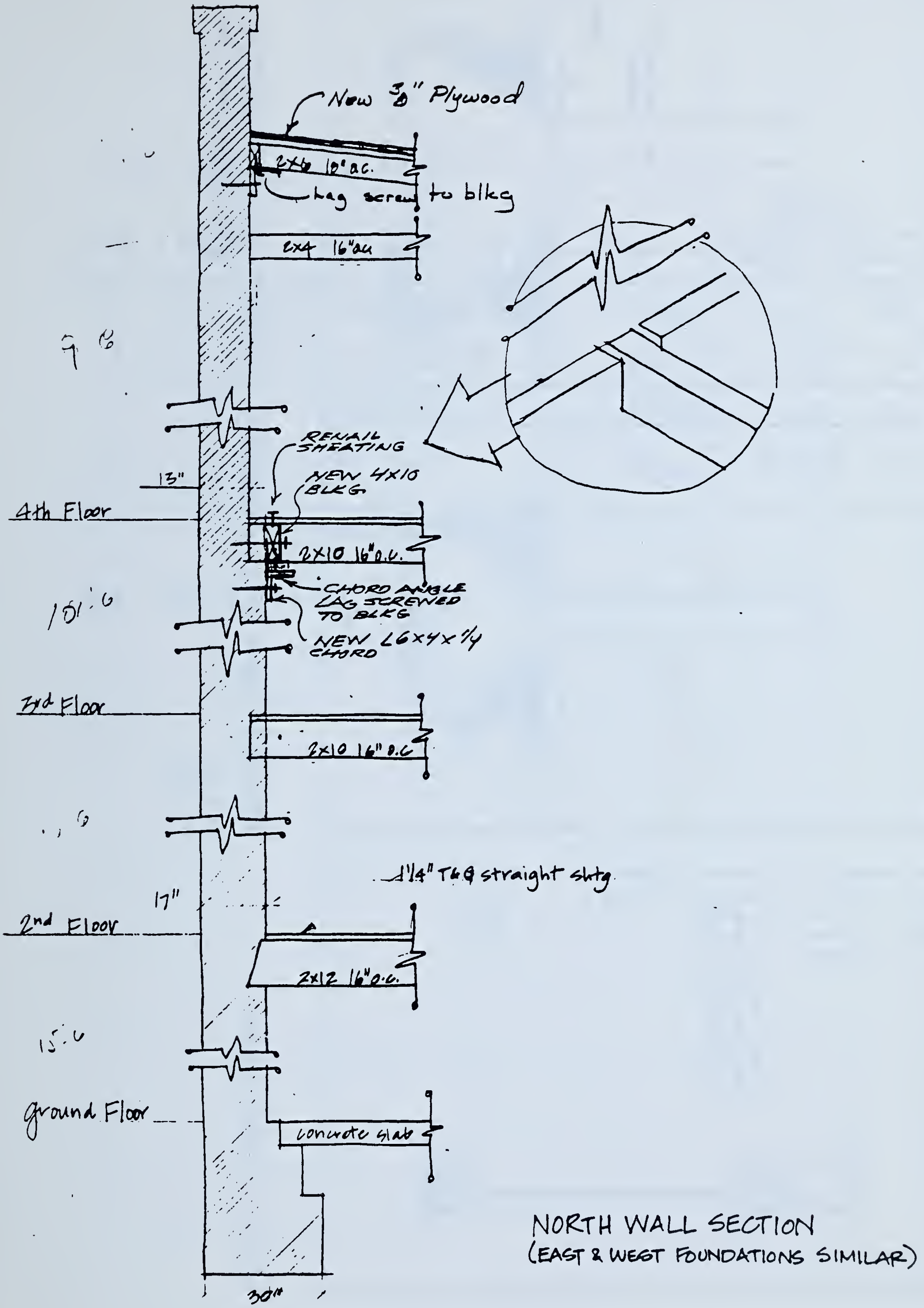
I
W10x49 - 116 - 5684#
W8x24 - 86 2064#
W8x31 - 78 2418#
W6x20 · 40 800#
W6x12 - 54 648#
W6x15 - 14 210#
11,824



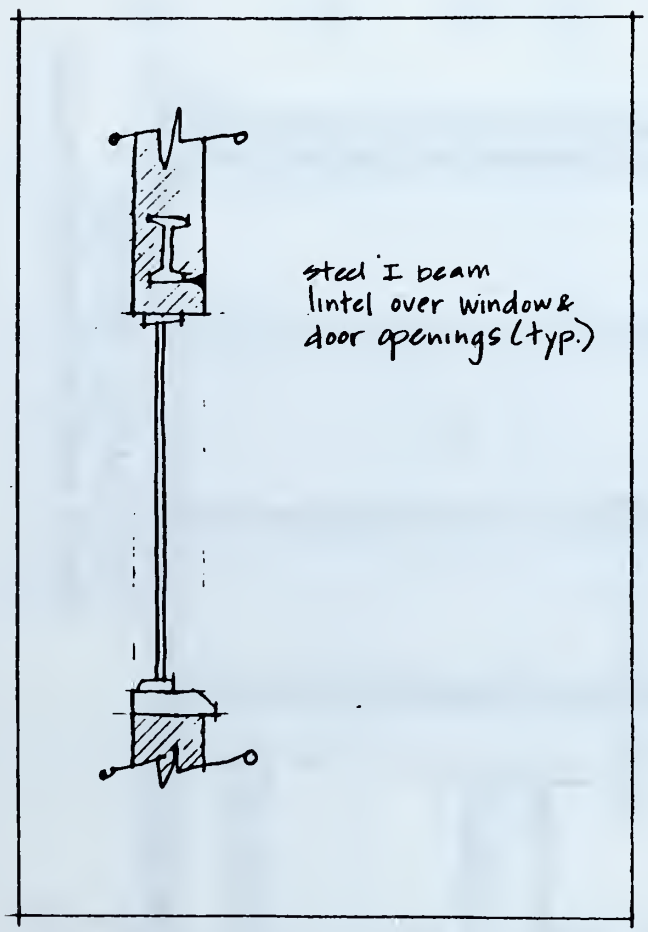
Parapet braces where height above roof exceeds 1½ t.

SOUTH INTERIOR ELEVATION
@ LINE ~~A~~
I
scale 1/8"=1'

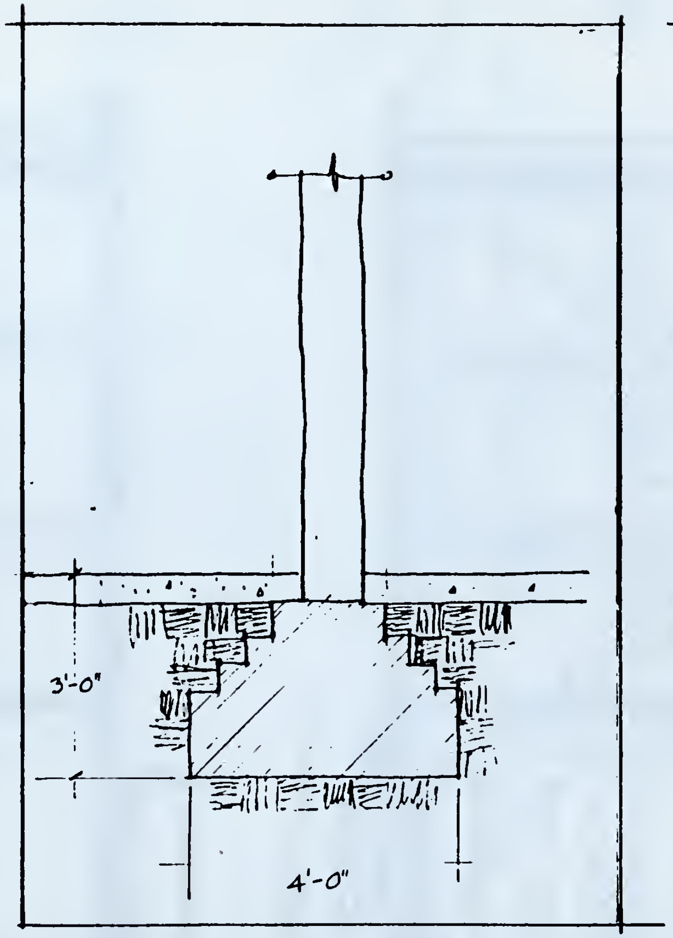
Scenario #7


New 3/8" Plywood
2x6 16" o.c.
Lag screw to blkg
2x4 16" o.c.
9'6
RENAIL SHEATING
NEW 4X10 BLKG
13"
4th Floor
2X10 16" o.c.
CHORD ANGLE LAG SCREWED TO BLKG
NEW L6X4X1/4 CHORD
18'6
3rd Floor
2x10 16" o.c.
1'4" T&G straight shtg.
17"
2nd Floor
2x12 16" o.c.
15'6
Ground Floor
concrete slab
30"
NORTH WALL SECTION
(EAST & WEST FOUNDATIONS SIMILAR)

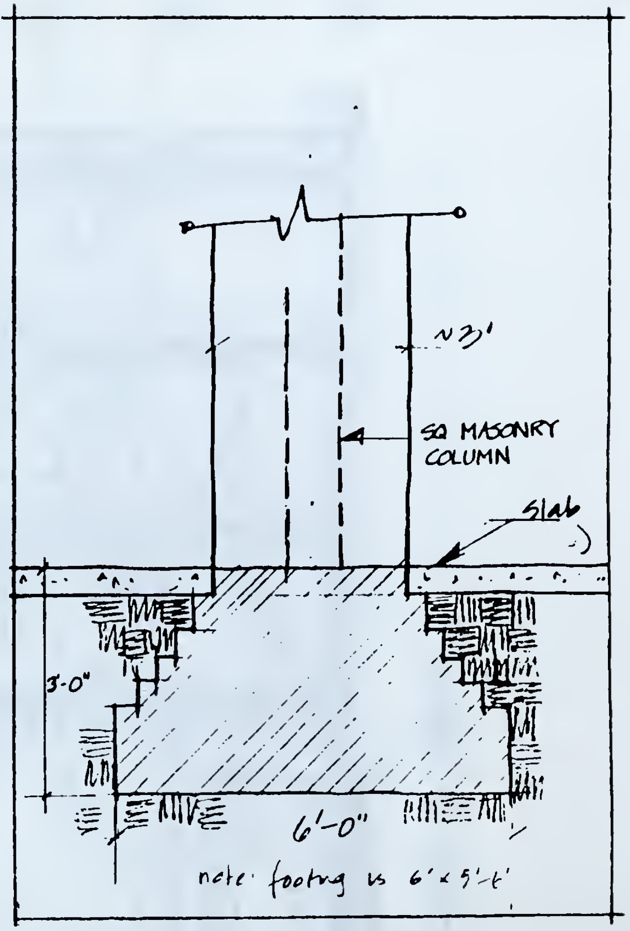
Scenario #7



DETAIL 1: Typical Opening



DETAIL 2: Typical Interior Column/Footing



DETAIL 3: Typical Column/Footing
Ground Floor @ South Wall

Scenario #7

$V = 0.1W$

0.1

level	Δh	h	w	wh	$\frac{wh}{\Sigma}$	F_{TOT}	Diaphragm F_{long}	 F_{Trans}
R	11.5	38.0	525	19950	.27	71 (94)	34 24 32	81 58 78
4	10.5	36.5	641	23396	.32	84 (112)	40 33 44	93 70 93 ←
3	10.5	26.0	685	17810	.24	63.0 (94)	41 26 35	83 52 69
2	15.5	15.5	780	12090	.17	45 (60)	41 19 26	83 37 49
			2631	73246				

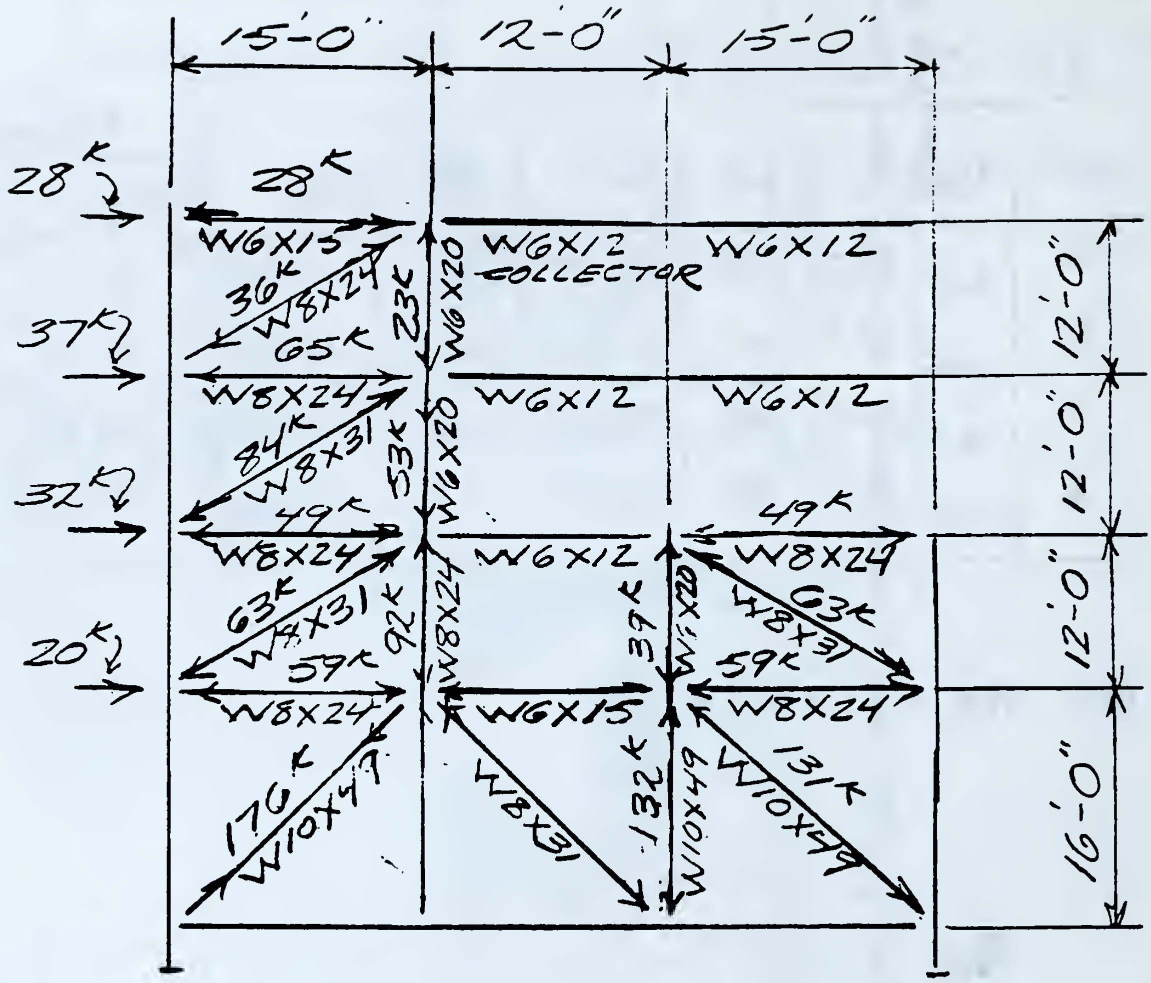
Base Shear = .1 × 2631 = 263

350

$$\frac{80}{3.2}$$

$$\frac{93}{112} = .83^{K}/' \times 25 = \frac{21^{K}}{29'} = 720\ p/f$$

BLDG. #2



ELEV. - LINE I

LONGITUDINAL -

$V = 350^{k}$

$V_W = 350/2 = 175^{k}$ PER WALL LINE

$L_W = 50'$

$v = 175^{k}/50' = 3500^{\#}/'$

$t = 17"$

$A = 17 \times 12 = 204\ in.^{2}$

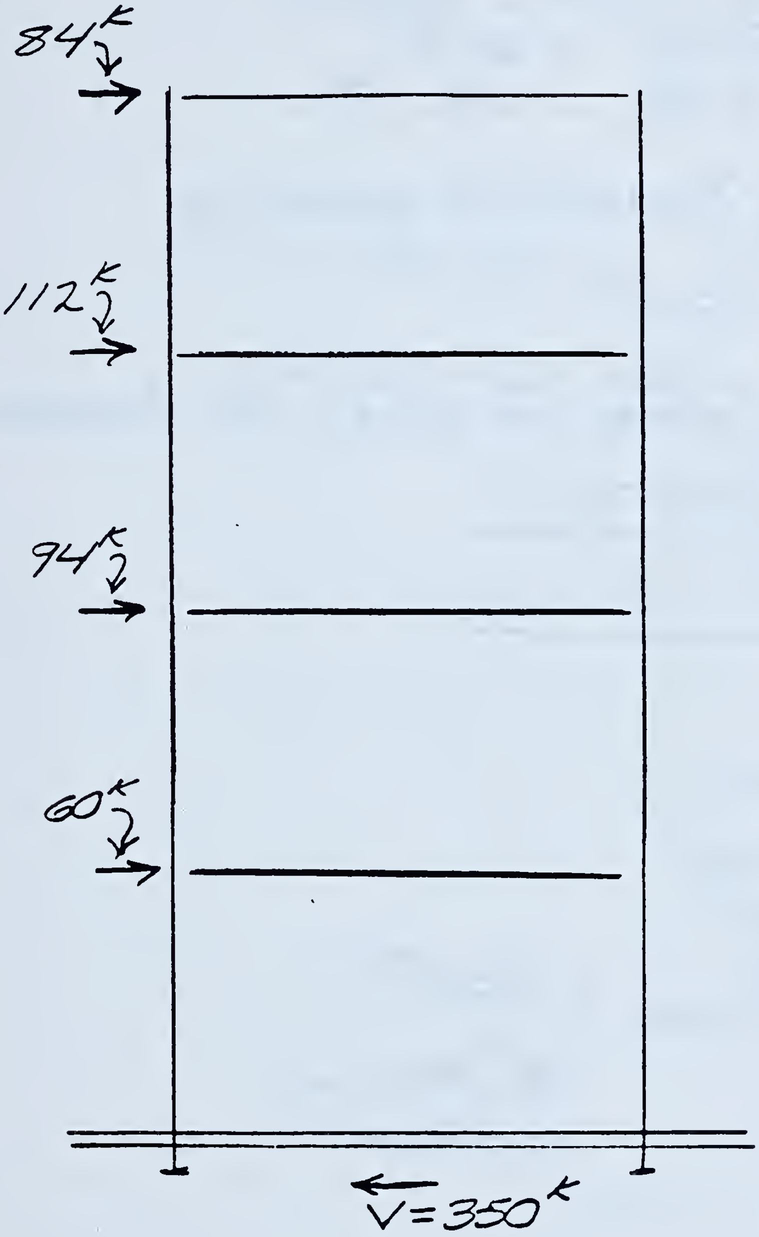
$p = 3500/204 = 17^{\#}/in.^{2} \rightarrow$ N.G

BLDG. #2

DEAD LOAD = 2631^{k}

KC = 0.133

$V = 0.133 \times 2631^{k} = 350^{k}$



N = 3 FRAMES

$V = 350^{k}/3 = 117^{k}$

BLDG #2

$V_u = 2 \times 175^k / 0.85 = 412^k$

$t = 6''$

$v_u = 2\sqrt{3000} = 109^{\#}/in.^2$

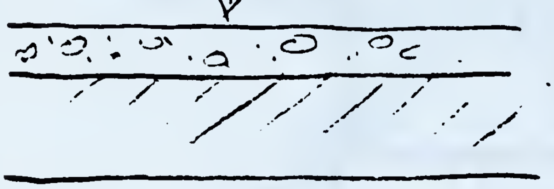
$V_c = 6'' \times 12'' \times 109 = 7.85^{k}/'$

$v_s = 4\sqrt{3000} = 218$

$V_s = 72 \times 218 = 15.7^{k}/'$

$\Sigma V = 23.5^{k}/'$

$L = 412^k / 23.5^{k}/' = 18'$



NEW GUNITE ON FACE OF WALL TO UNDERSIDE OF 3RD FLR.

DIAPHRAGM -

$V_{MAX.} = 93^k$

$L = 32'$

$v = 93 / 2 \times 32 = 352^{\#}/'$

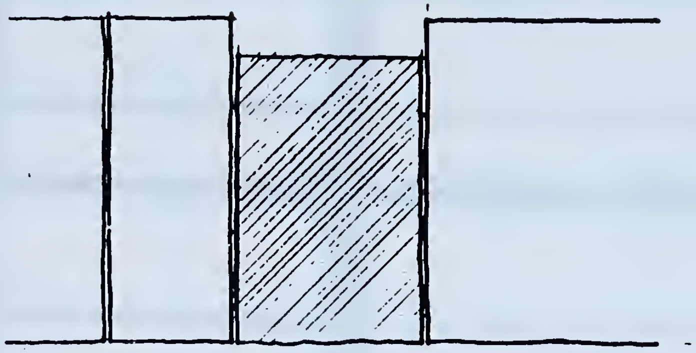
3/8" PLYW'D.

10d @ 4"

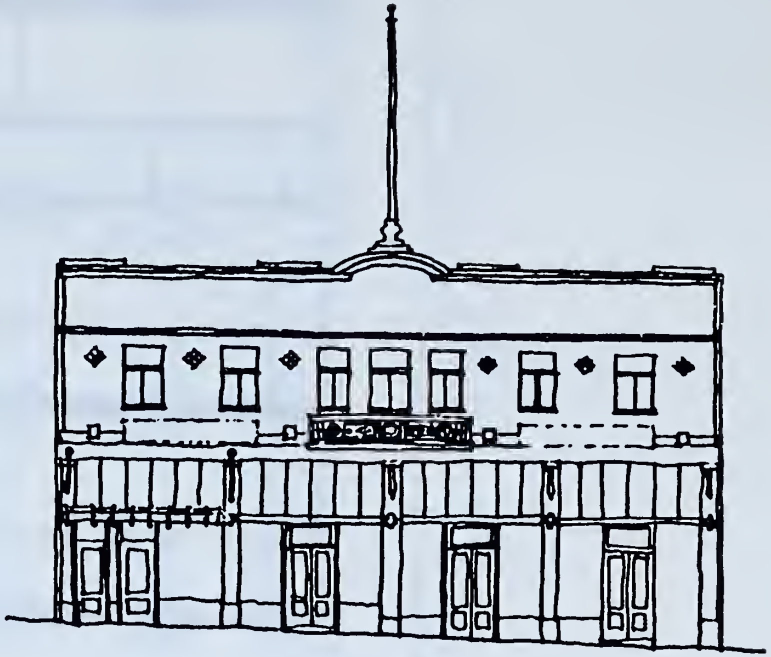
b: drawings of buildings

BUILDING #1

Number of Floors: 2	Period: $T = \frac{0.05h_n}{\sqrt{D}}$
Height: 38'-0"	
Width: 67'-6"	Transverse: 0.23 sec.
Length: 104'-8"	Longitudinal: 0.19 sec.

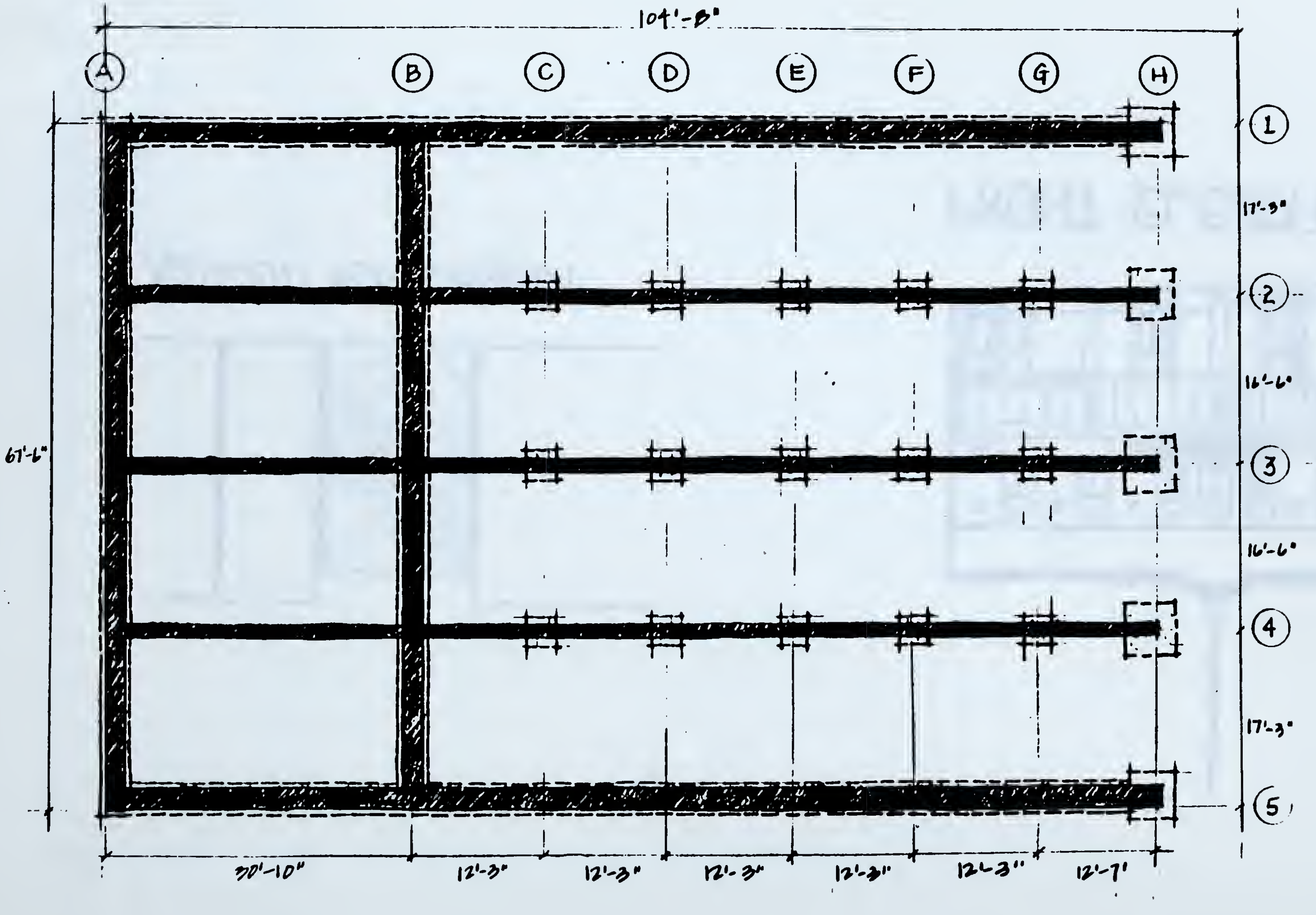


ADJACENT BLDG DIAGRAM



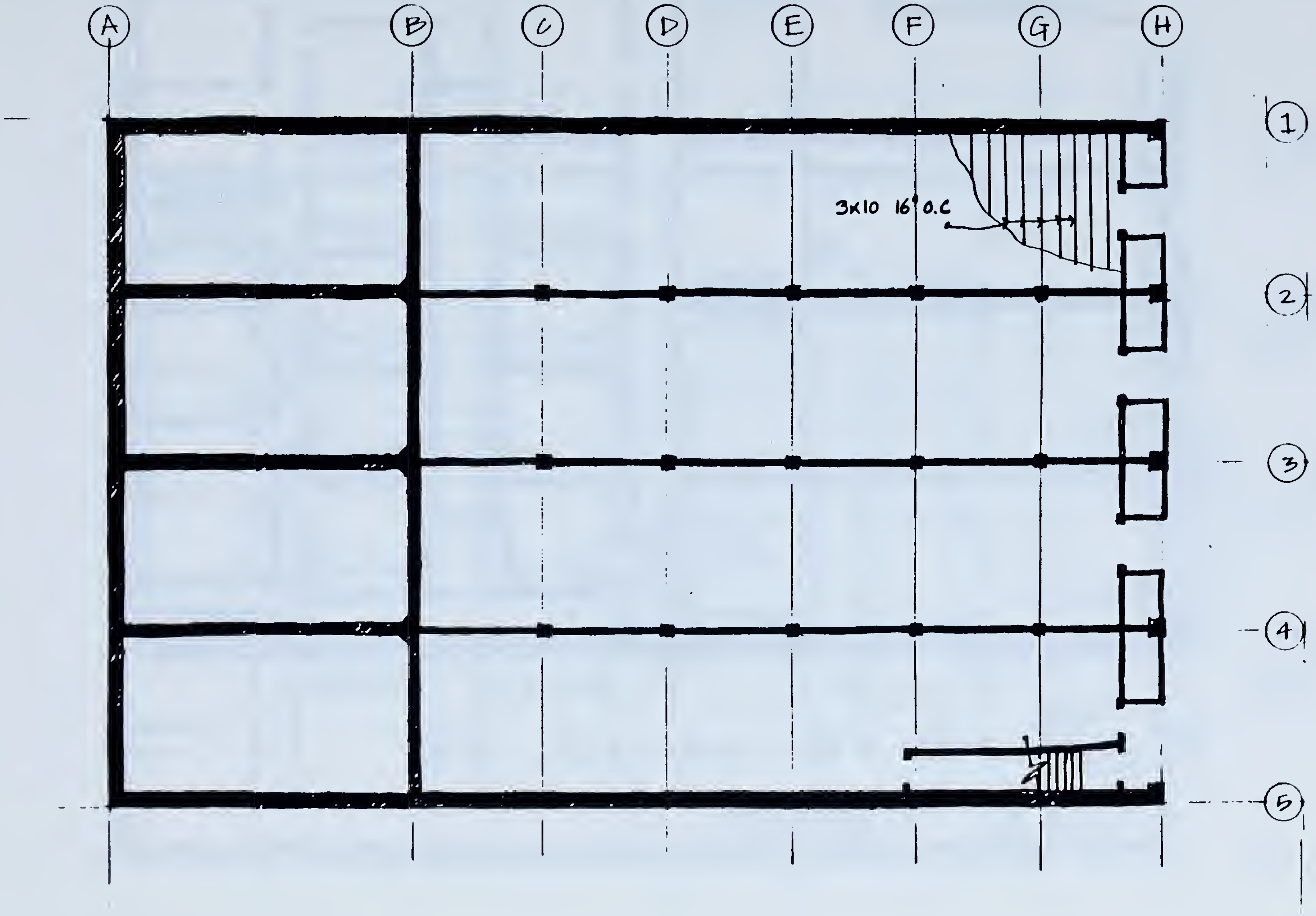
FRONT ELEVATION

BUILDING #1



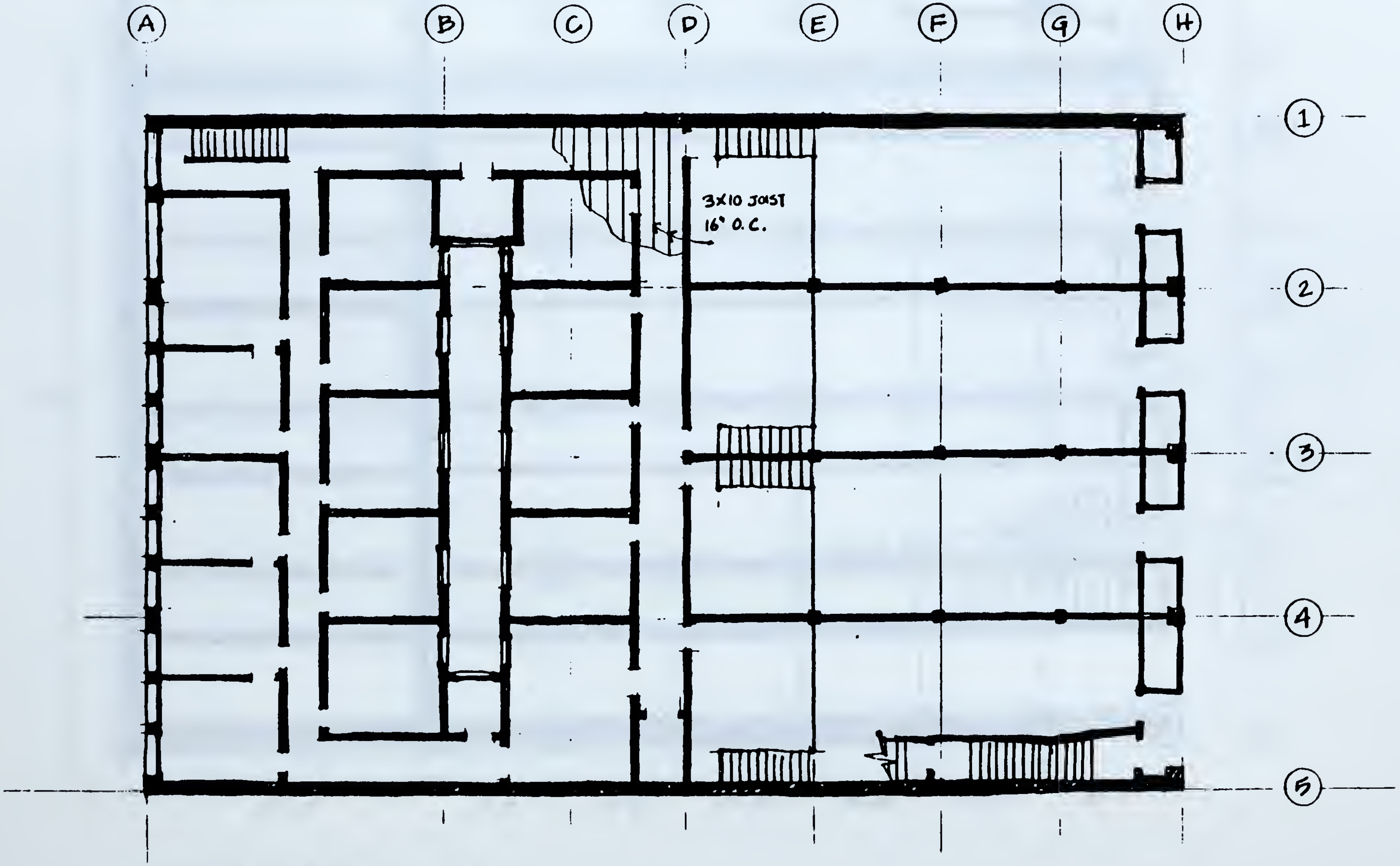
FOUNDATION PLAN

BUILDING #1



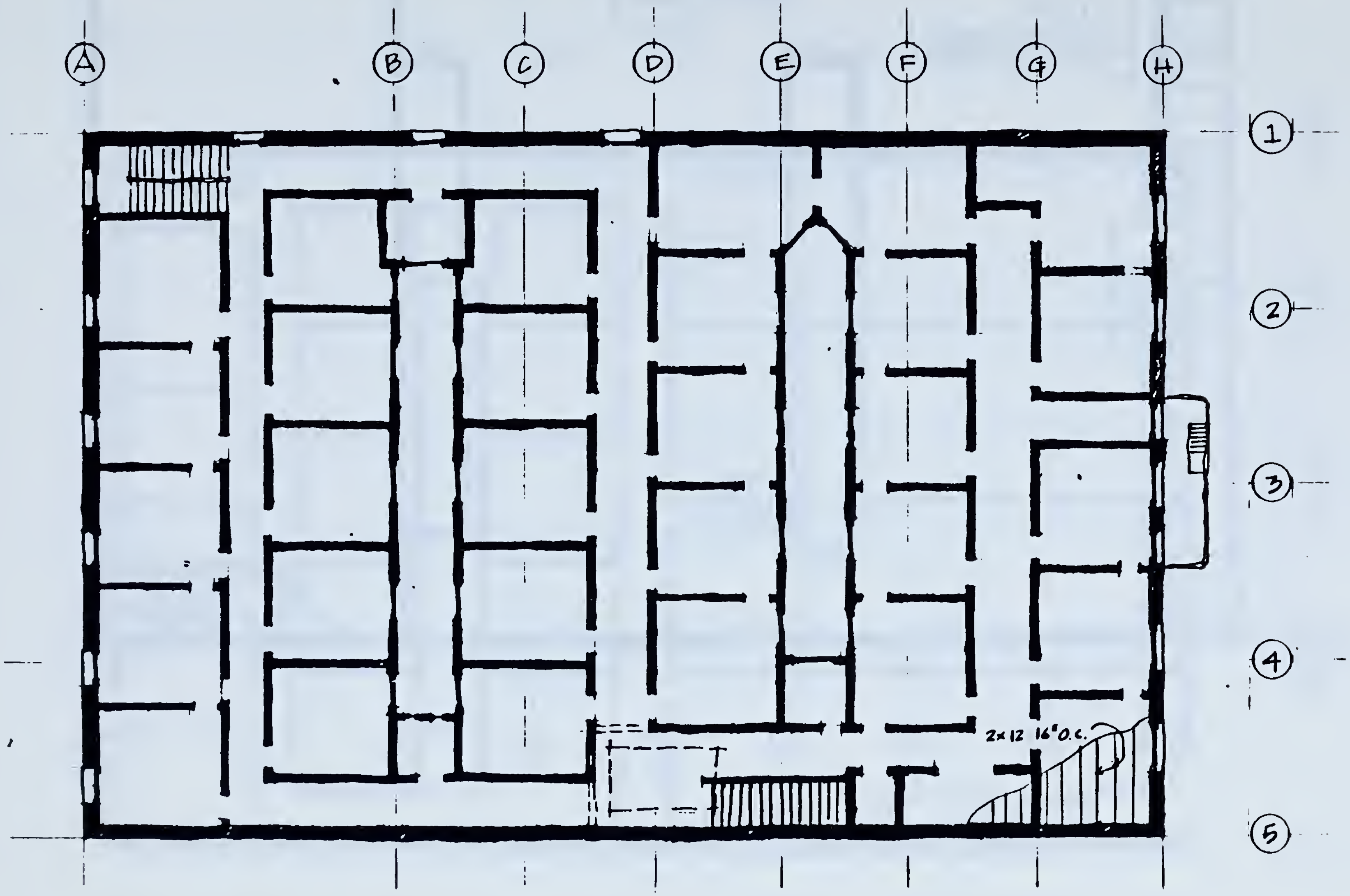
FIRST FLOOR PLAN

BUILDING #1



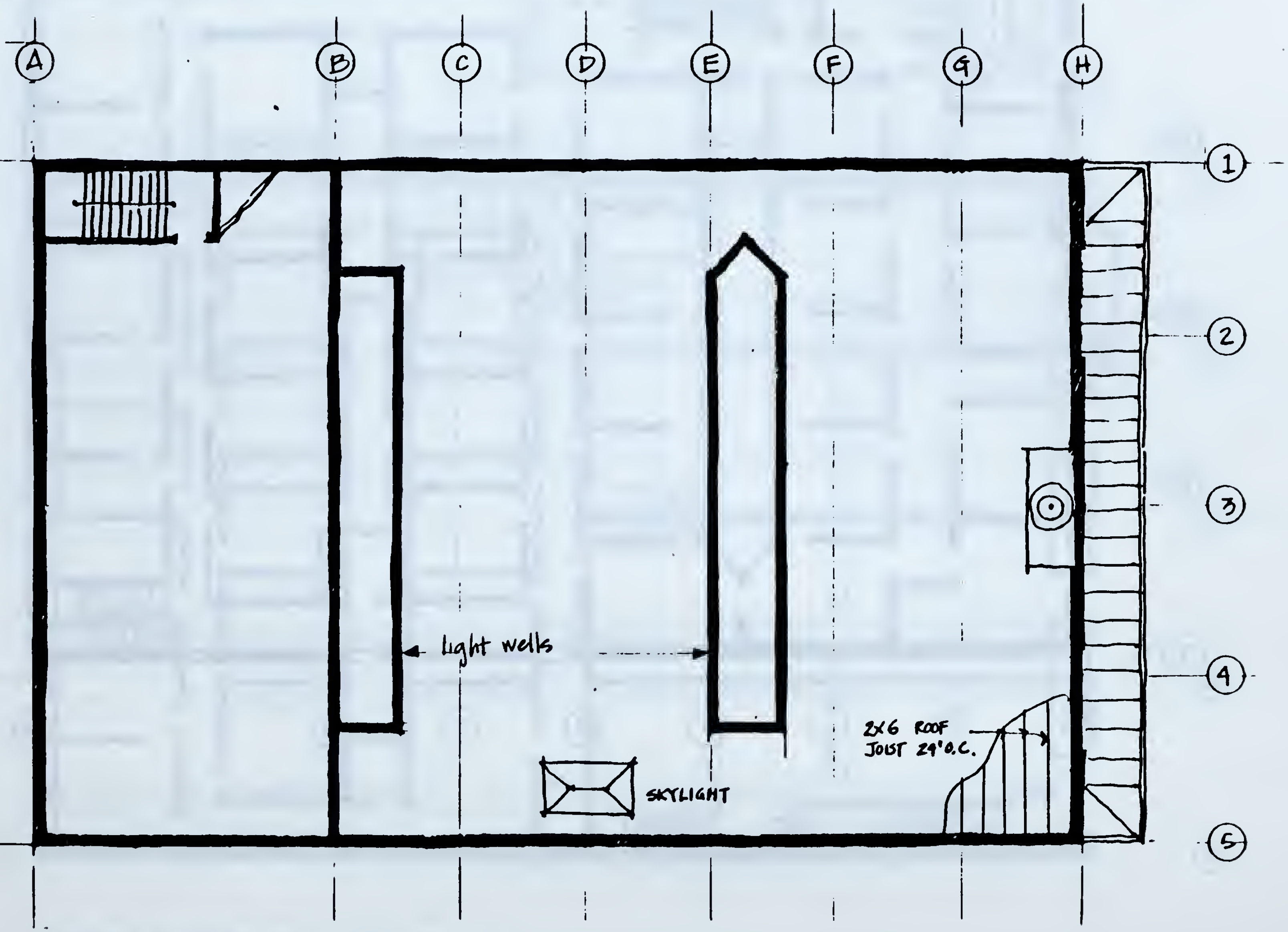
MEZZANINE FLOOR PLAN

BUILDING #1

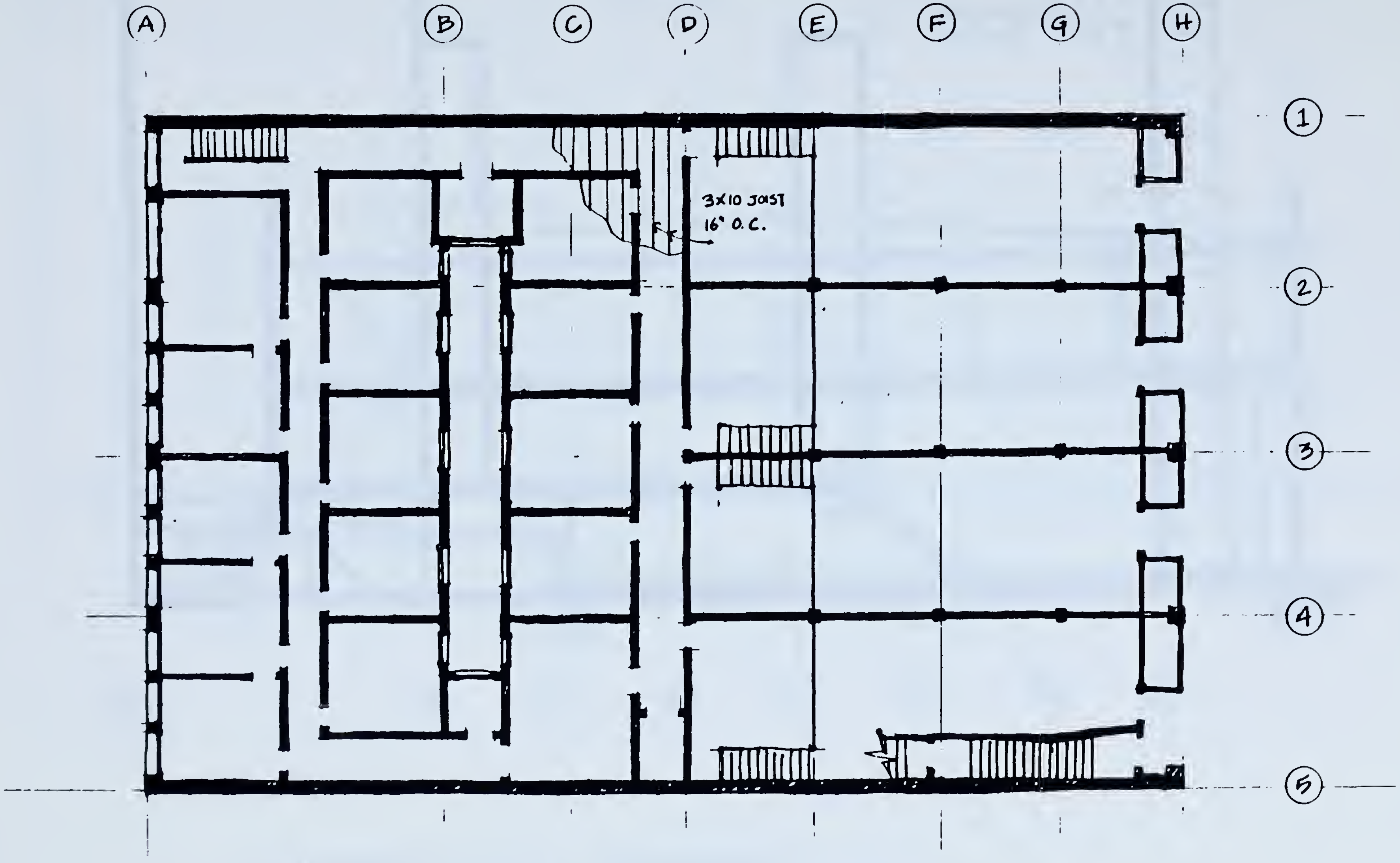


SECOND FLOOR PLAN

BUILDING #1

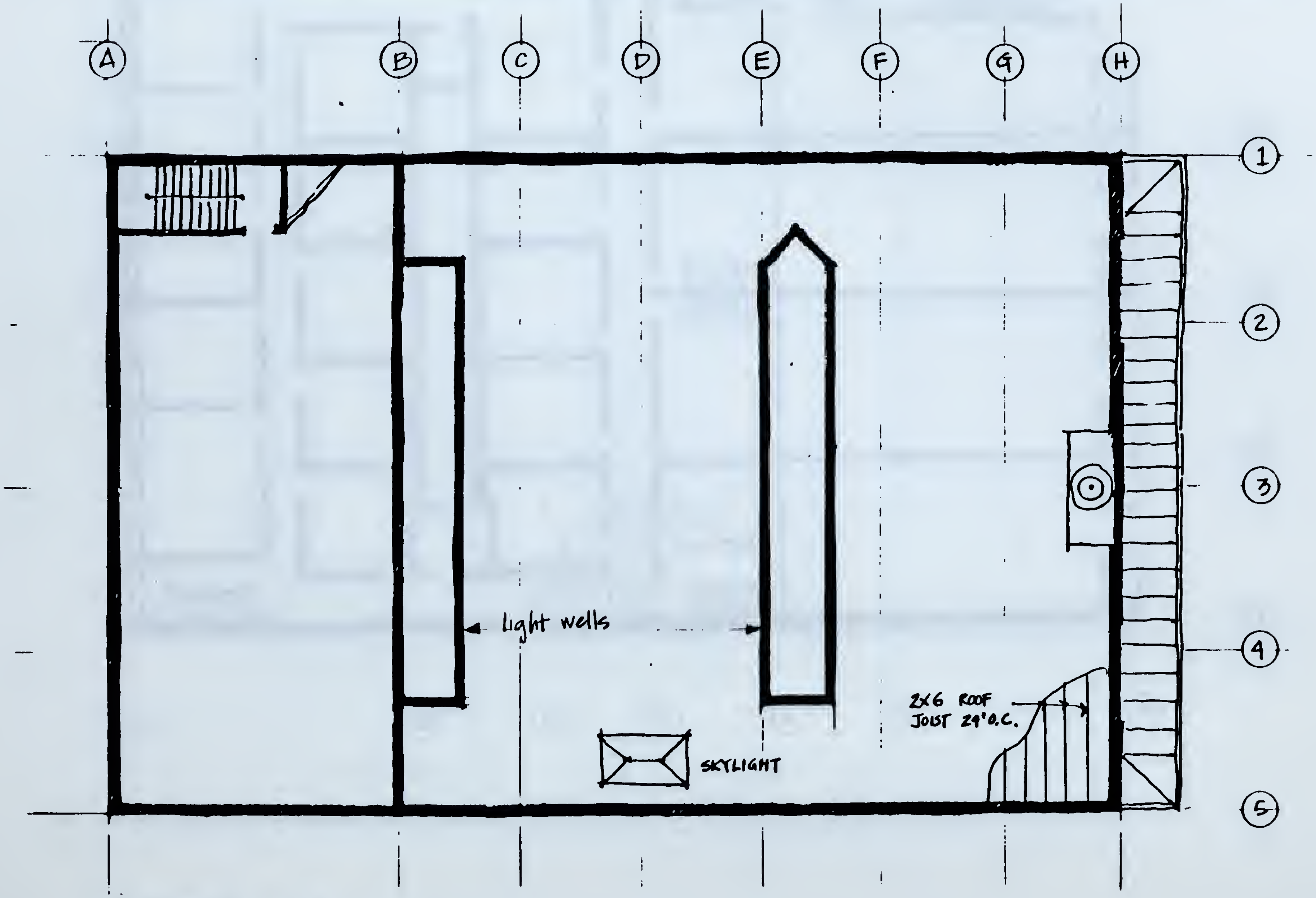


ROOF PLAN

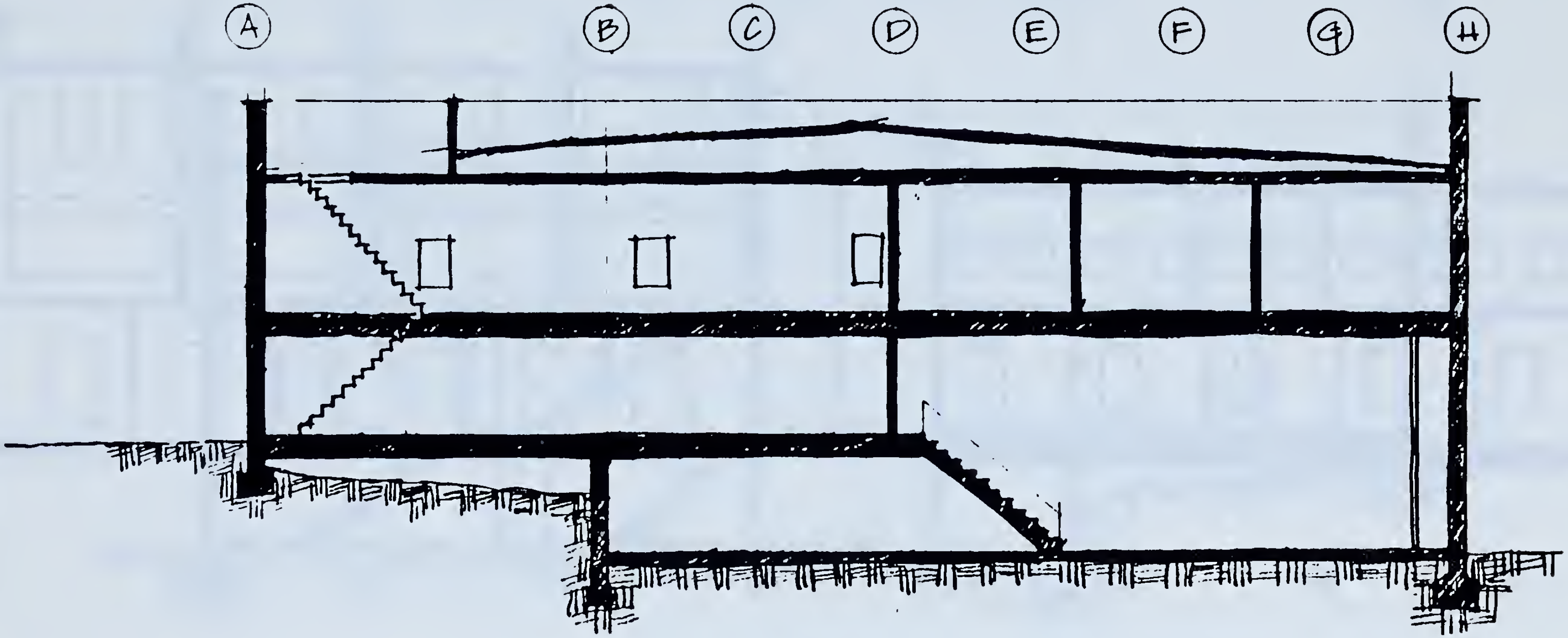


MEZZANINE FLOOR PLAN

BUILDING #1

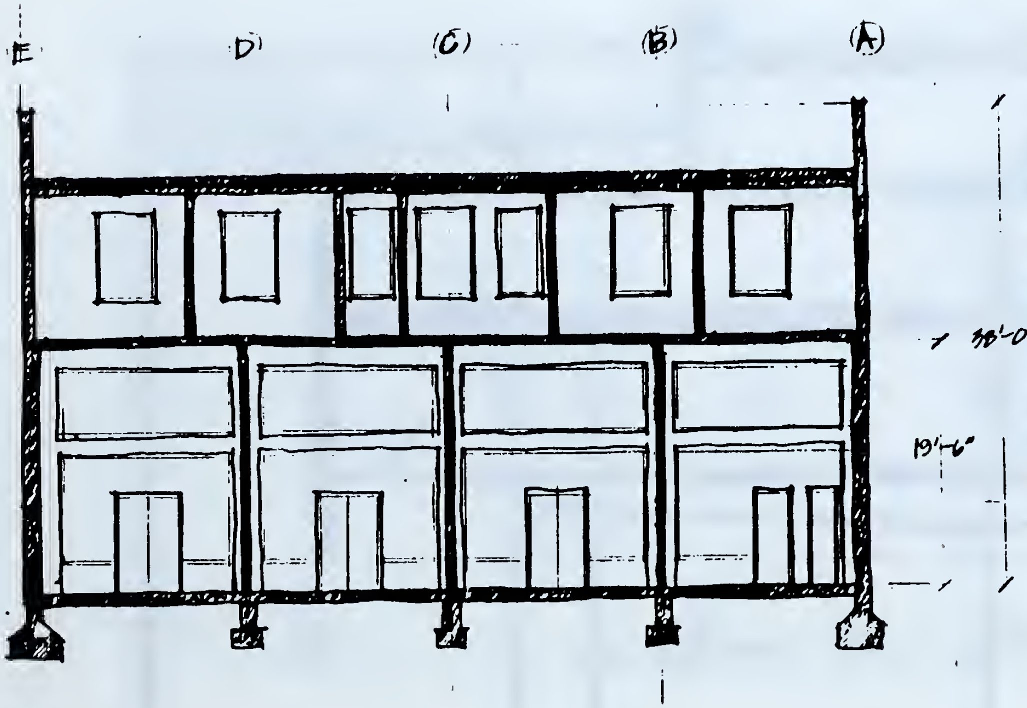


ROOF PLAN

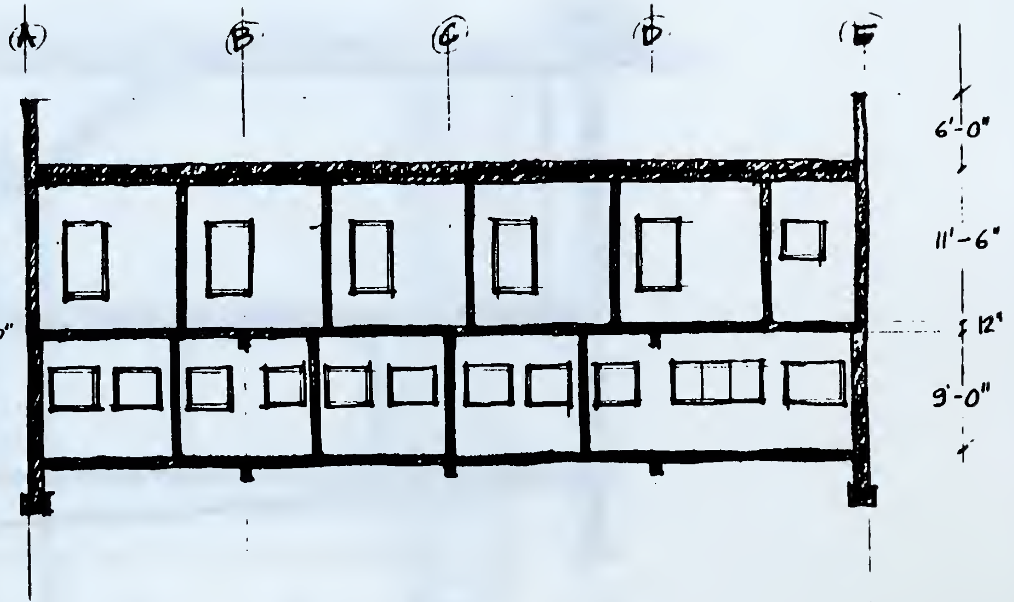


INTERIOR WALL ELEVATION @ LINE 1

BUILDING #1

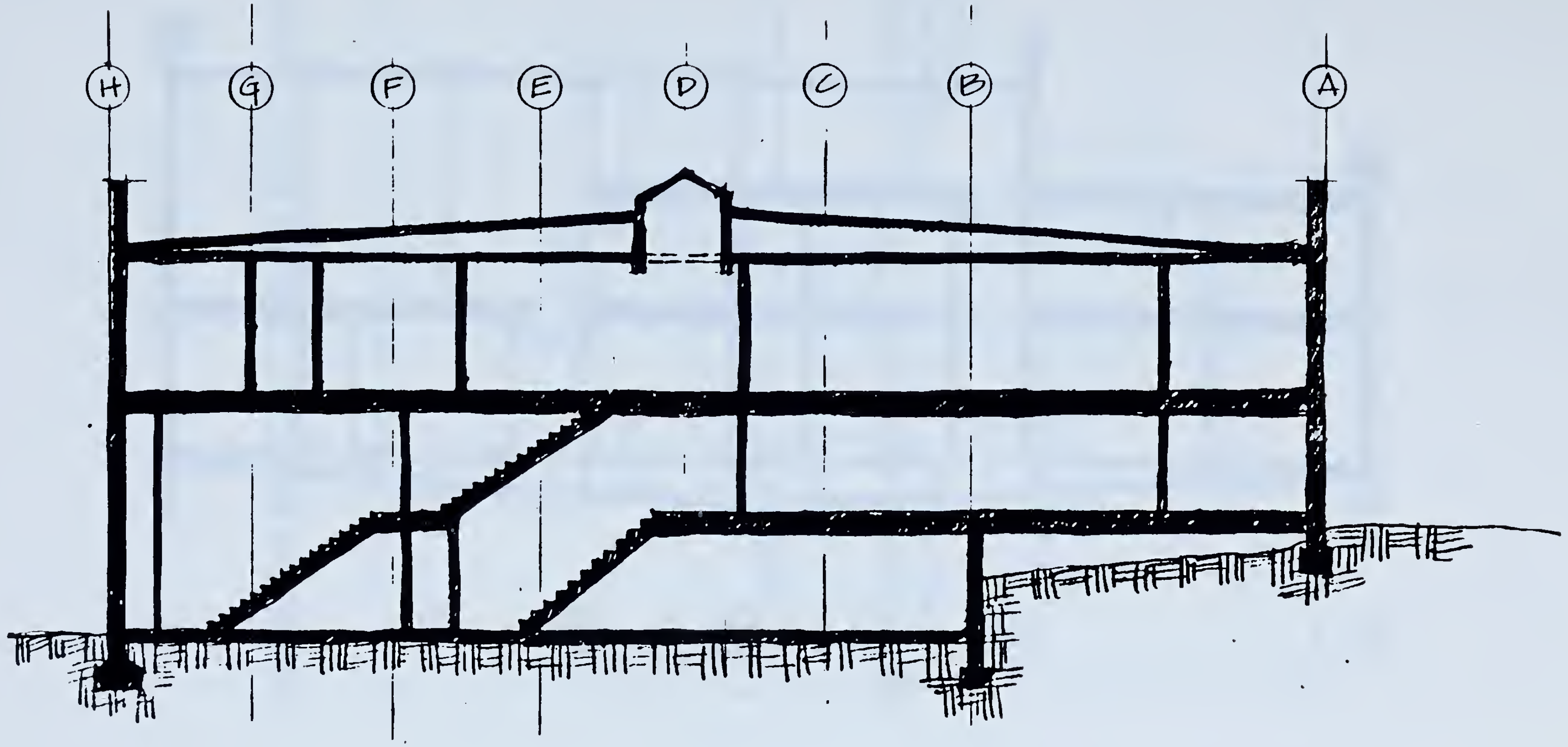


EAST INTERIOR ELEVATION
'@LINE H



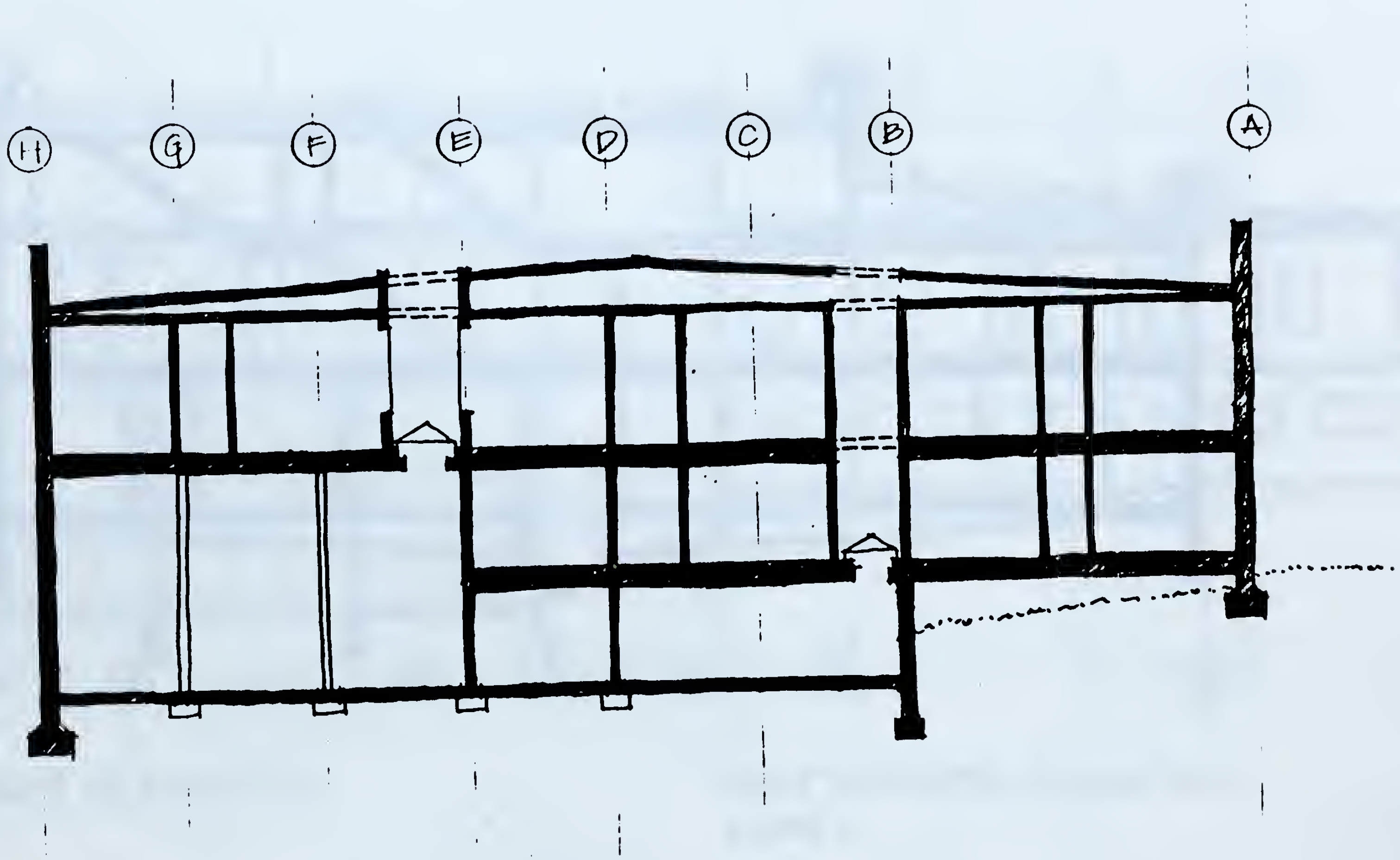
WEST INTERIOR ELEVATION
@LINE A

BUILDING #1



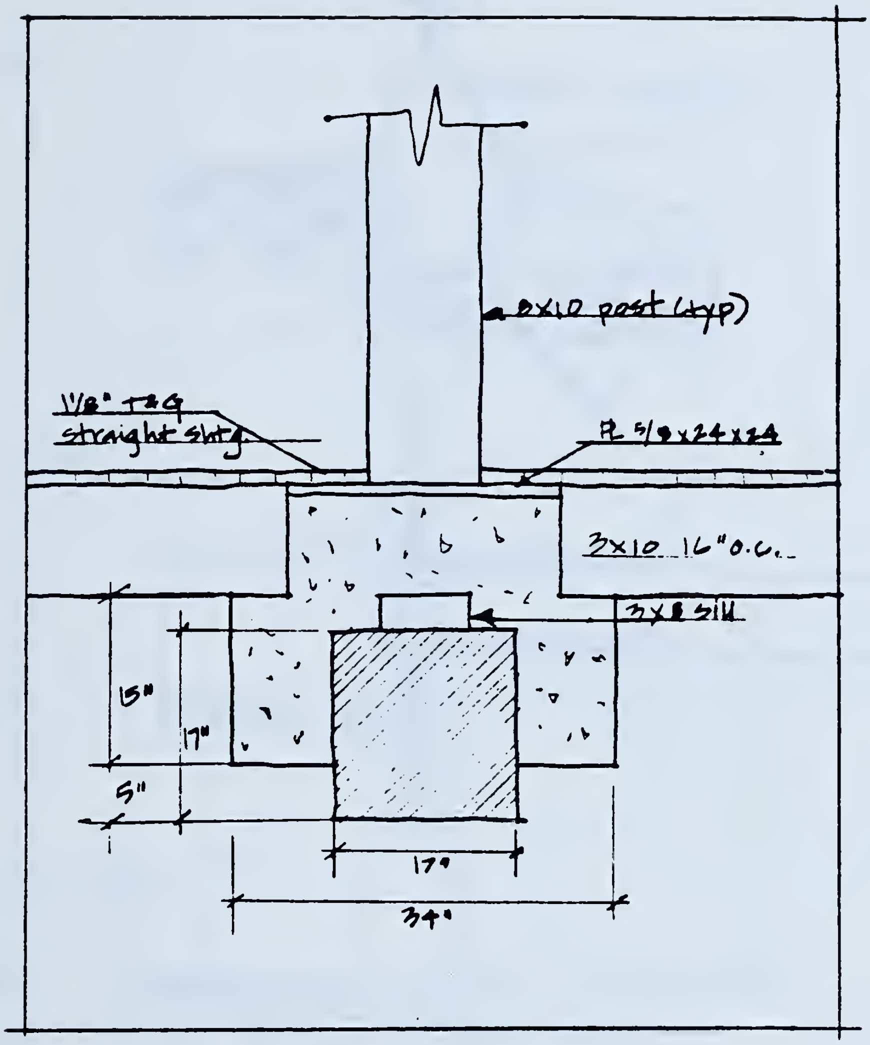
INTERIOR WALL ELEVATION @ LINE 5

BUILDING #1



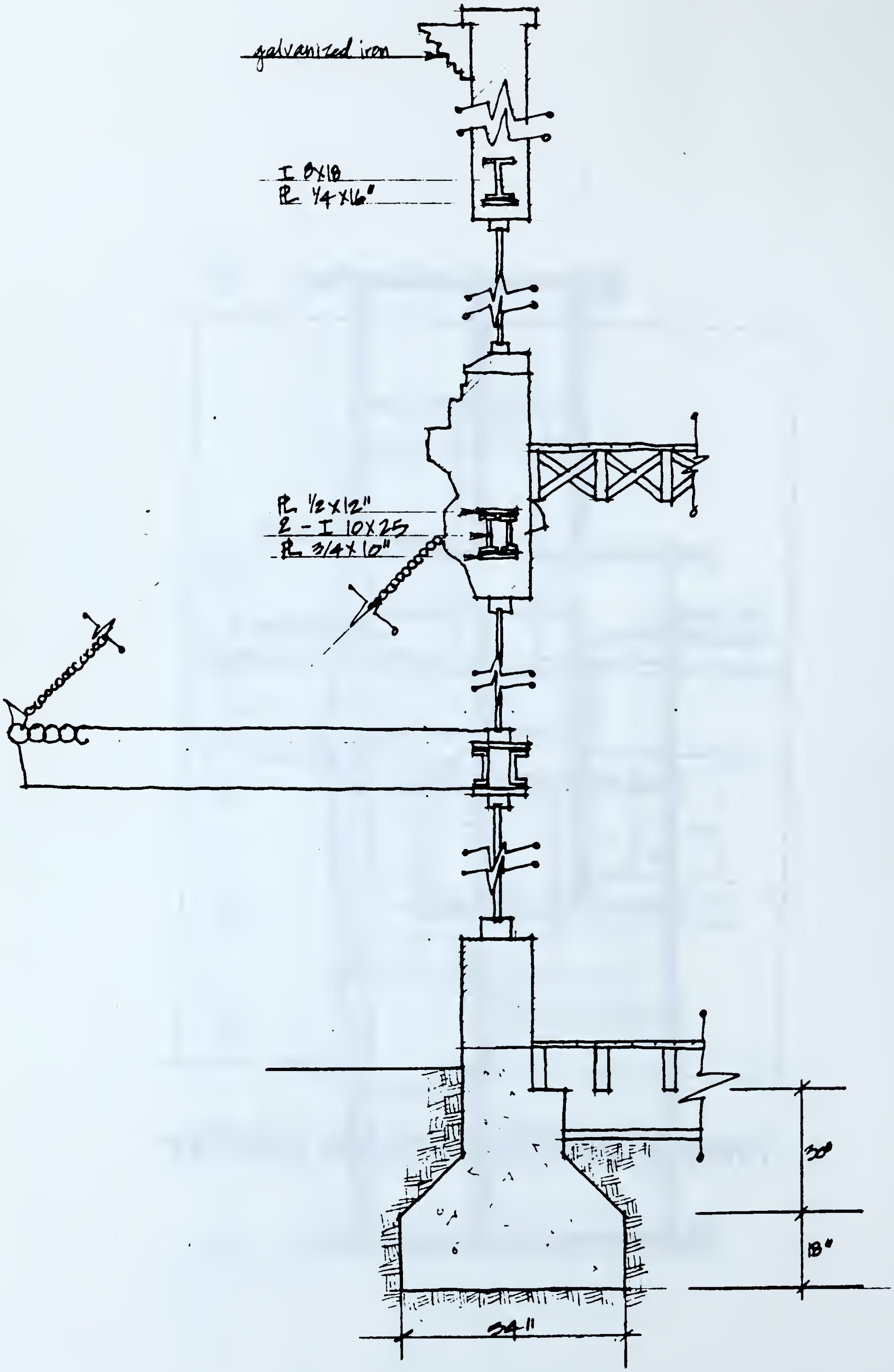
SECTION @ LINE 4

BUILDING #1



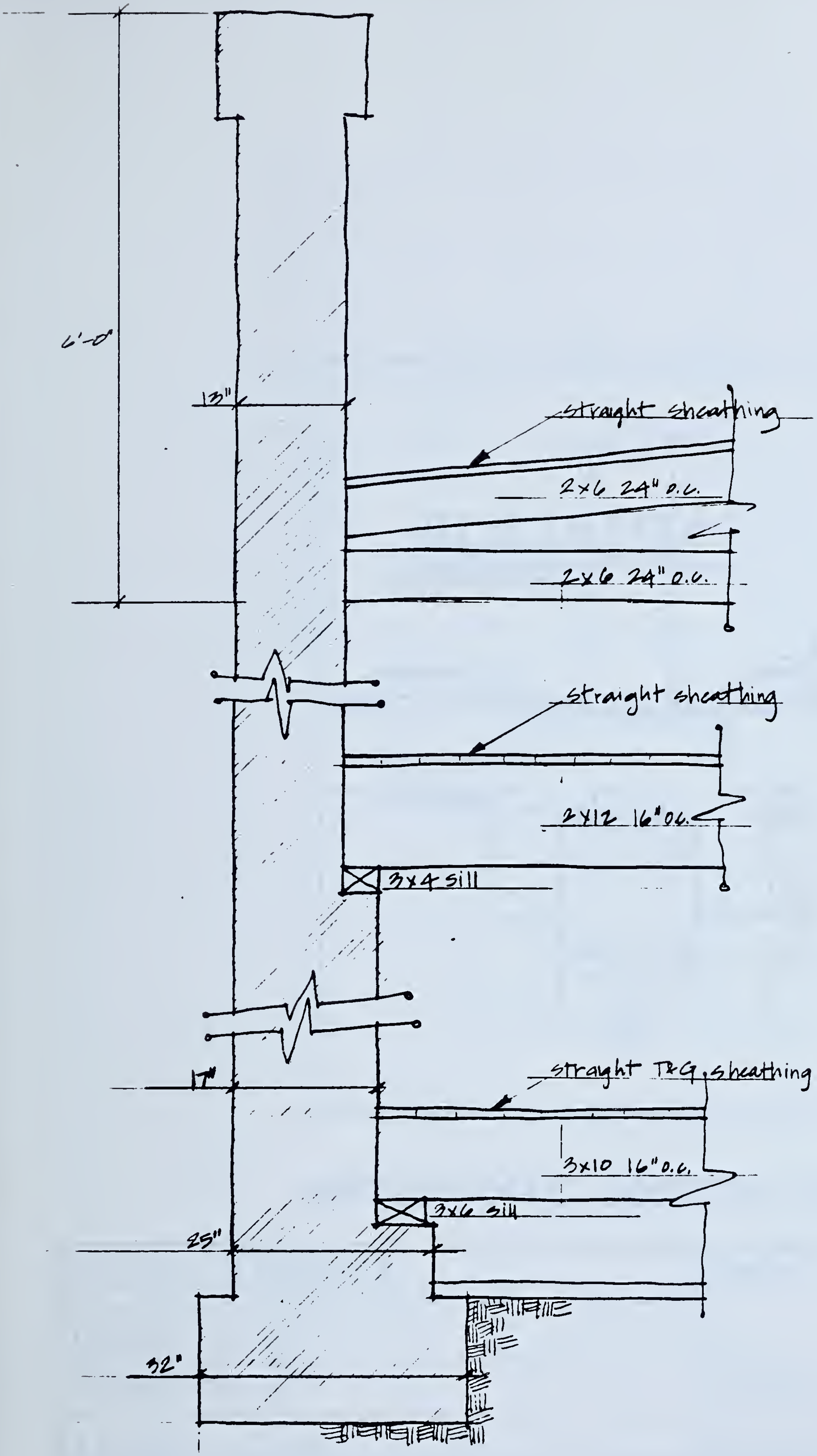
TYPICAL INTERIOR COLUMN FOOTING

BUILDING #1



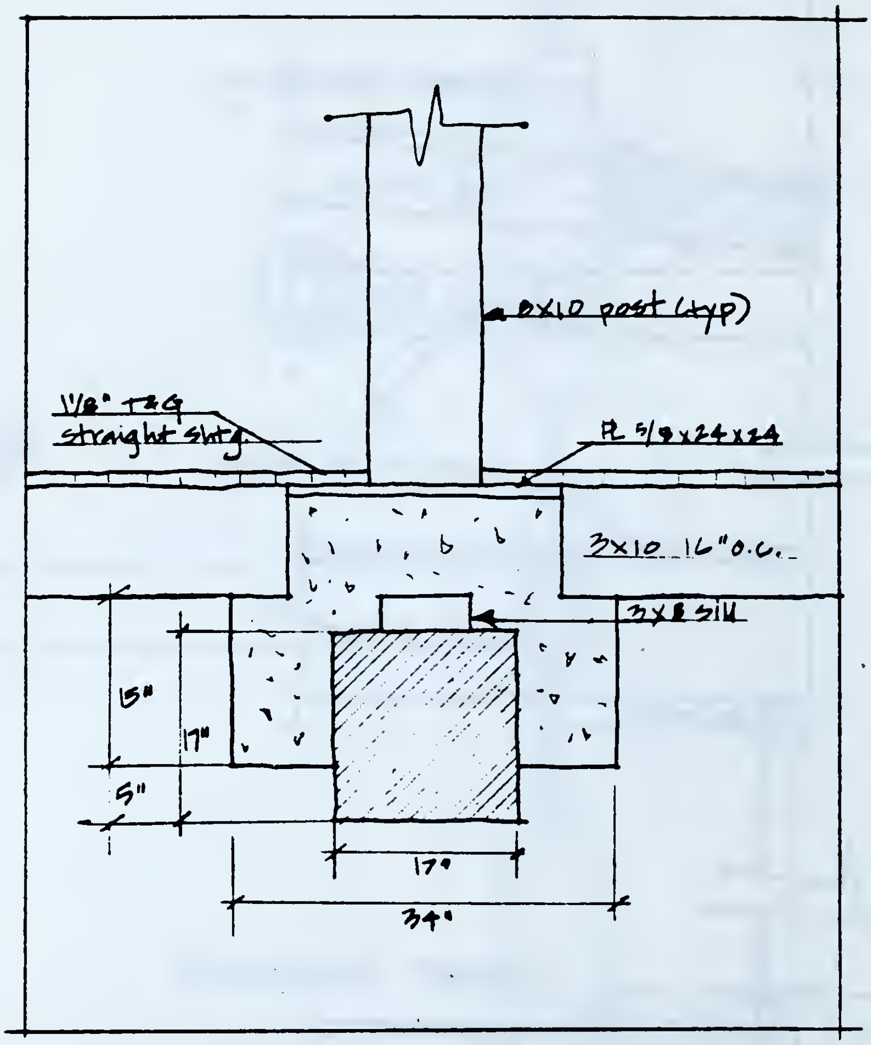
EAST WALL SECTION

BUILDING #1



N-S WALL SECTION

BUILDING #1

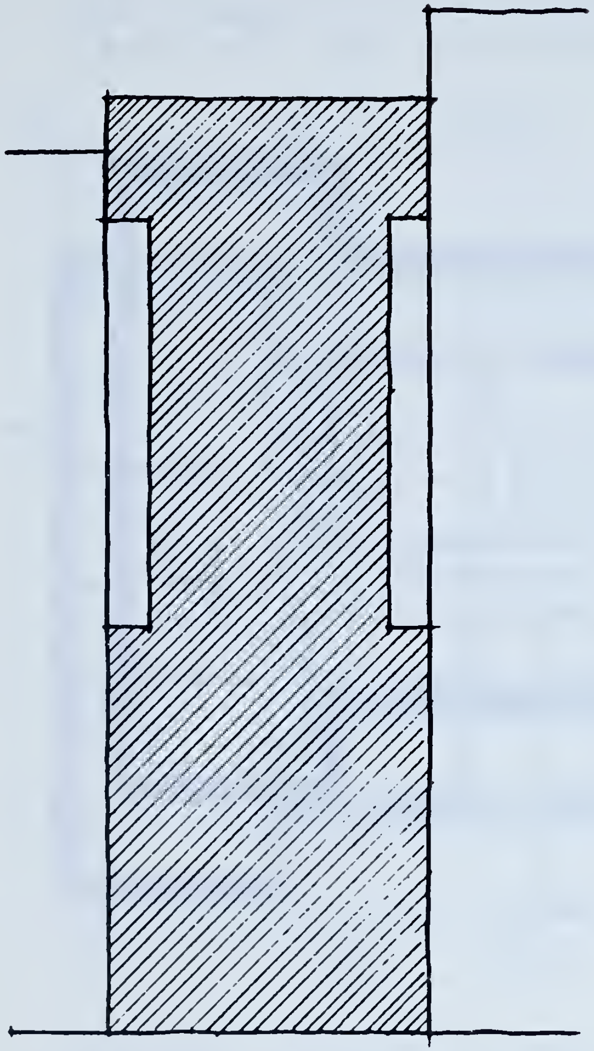


TYPICAL INTERIOR COLUMN FOOTING

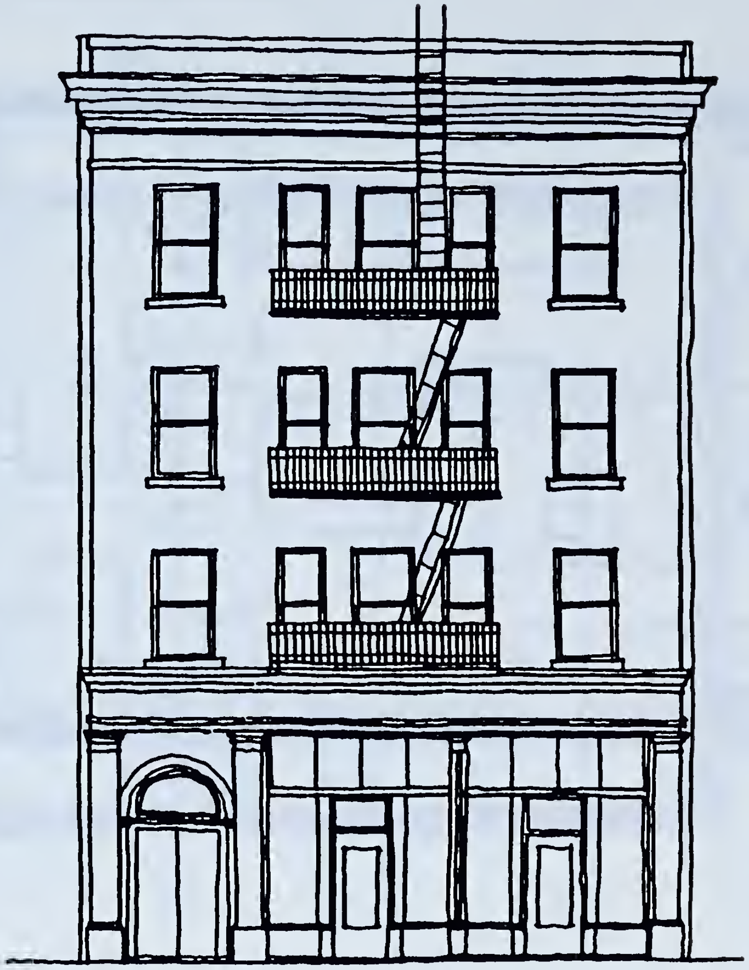
BUILDING #1

BUILDING #2

Number of Floors: 4	Period: $T = \frac{0.05h_n}{\sqrt{D}}$
Height: 52’-0"	
Width: 38’-6"	Transverse: 0.41 sec.
Length: 112’-6"	Longitudinal: 0.25 sec.

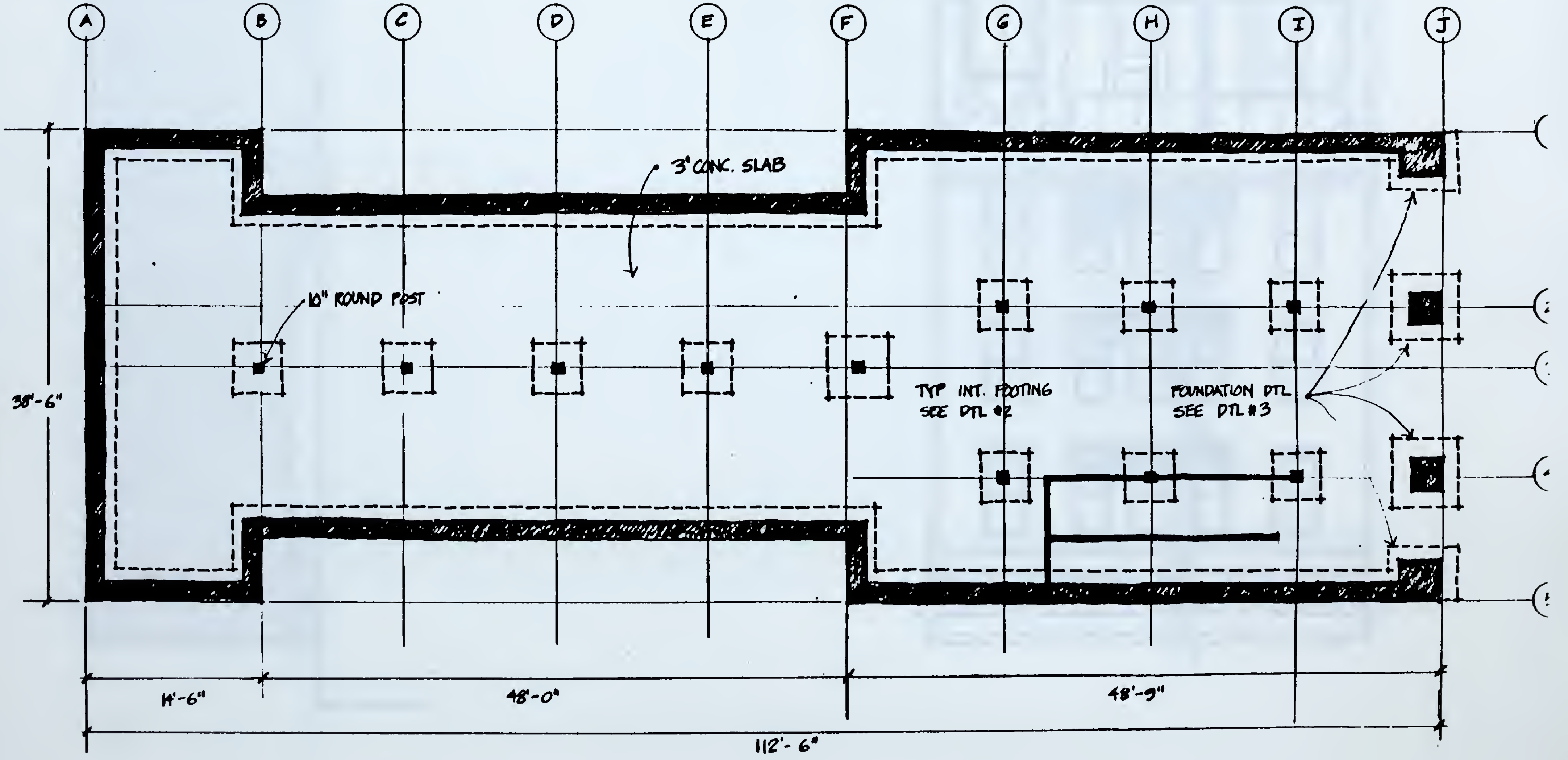


ADJACENT BLDG DIAGRAM



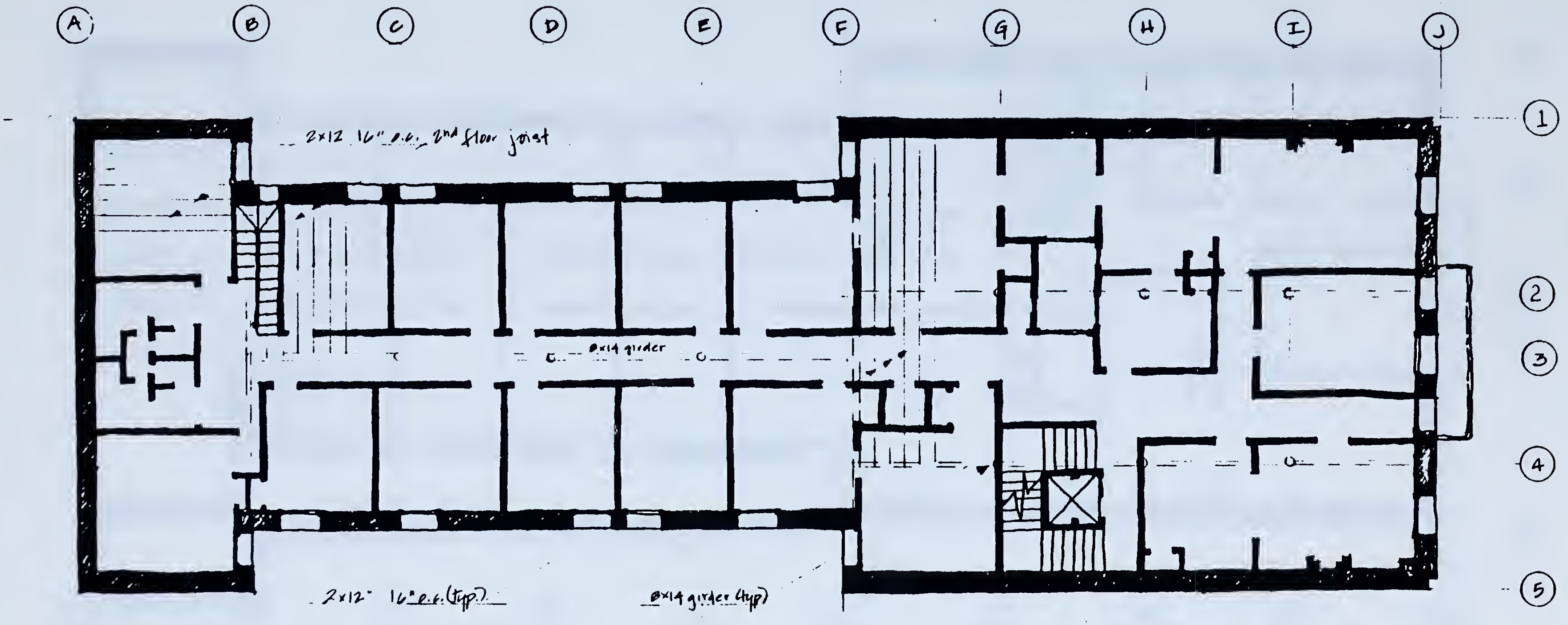
FRONT ELEVATION

BUILDING #2



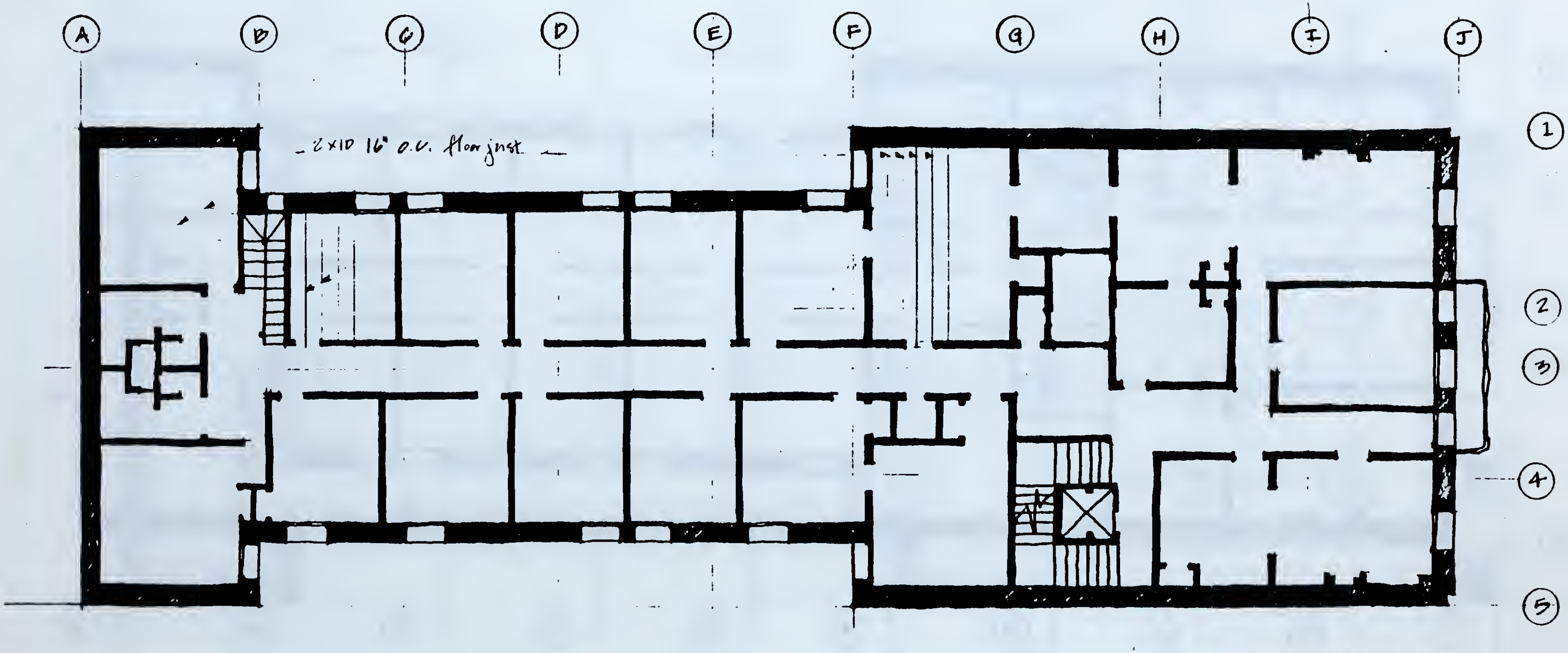
FOUNDATION / GROUND FLOOR PLAN

BUILDING #2



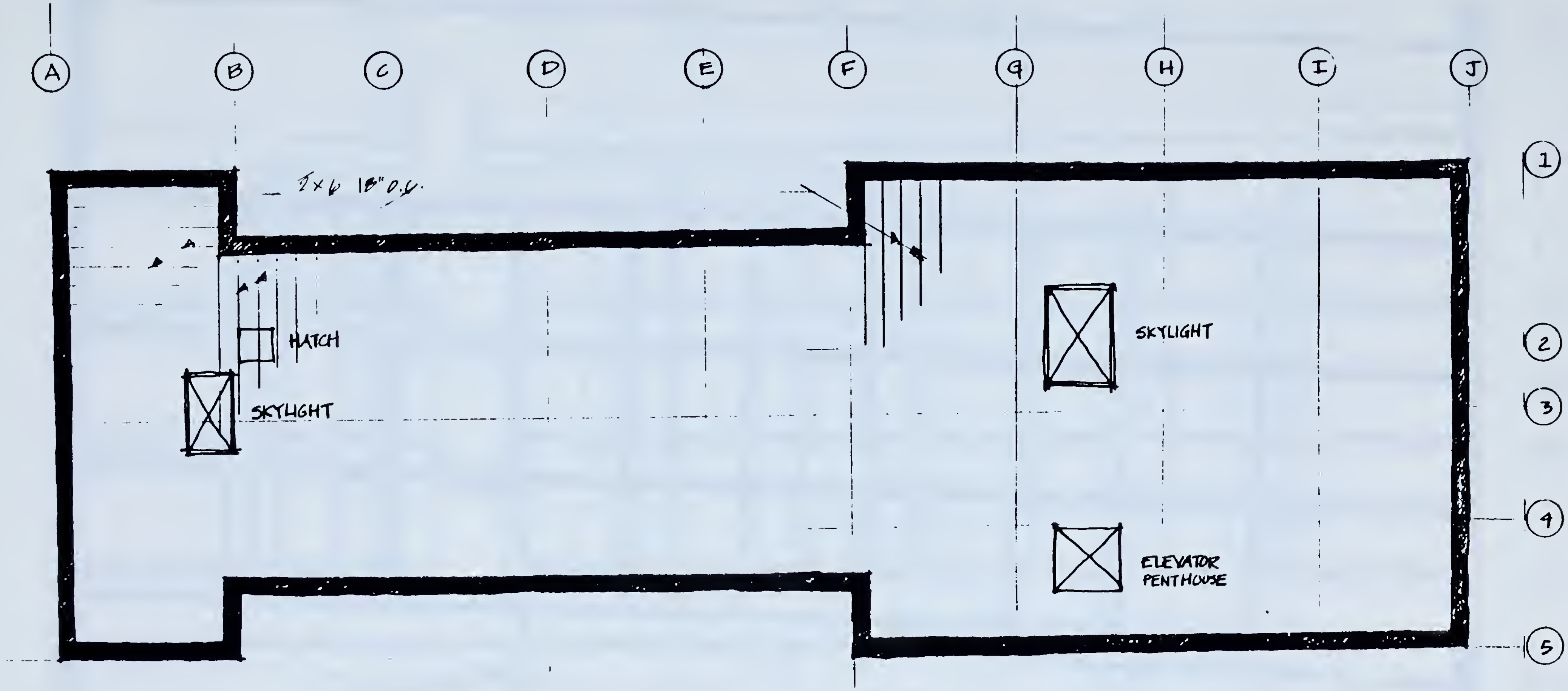
SECOND FLOOR PLAN

BUILDING #2



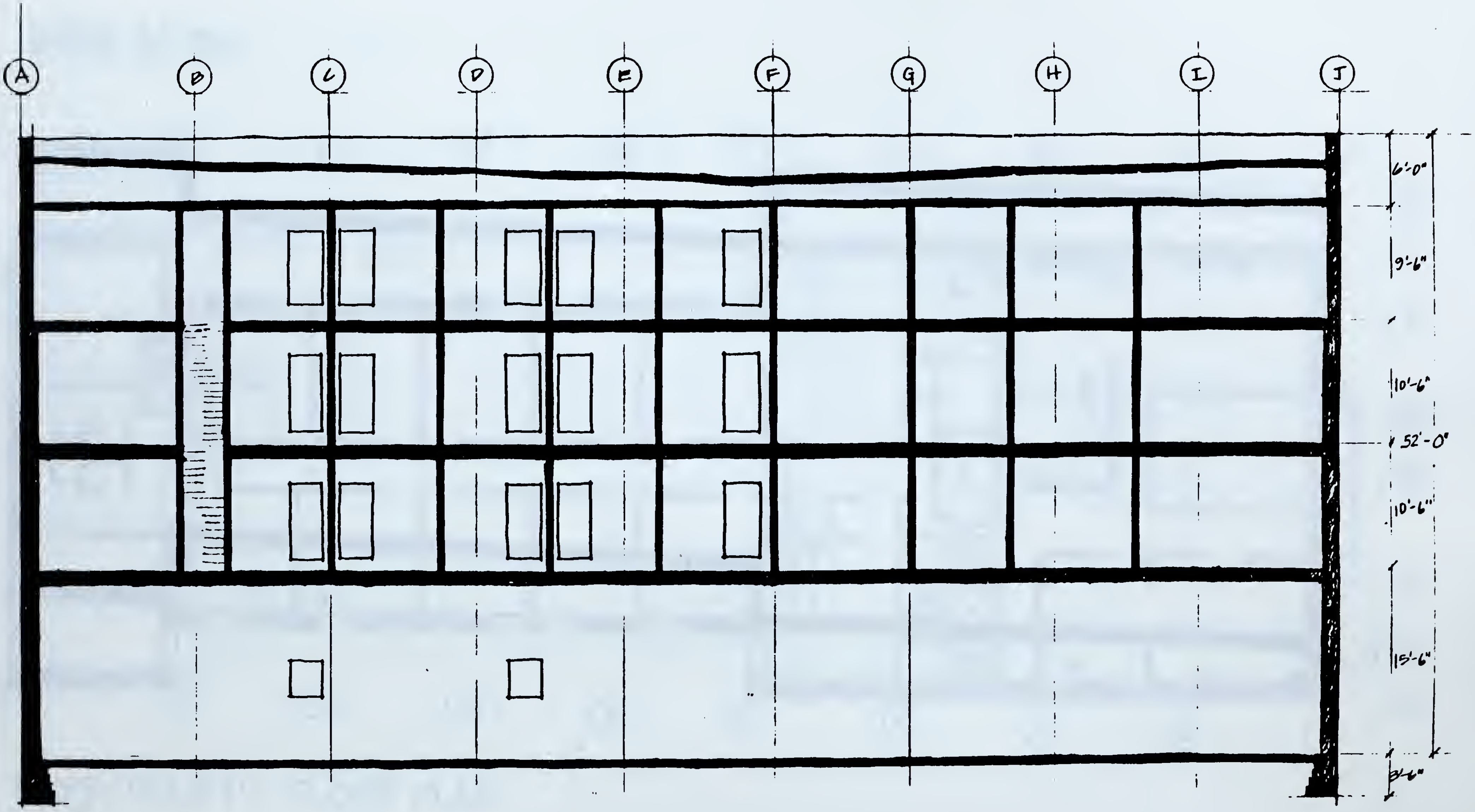
THIRD/FOURTH FLOOR PLAN

BUILDING #2



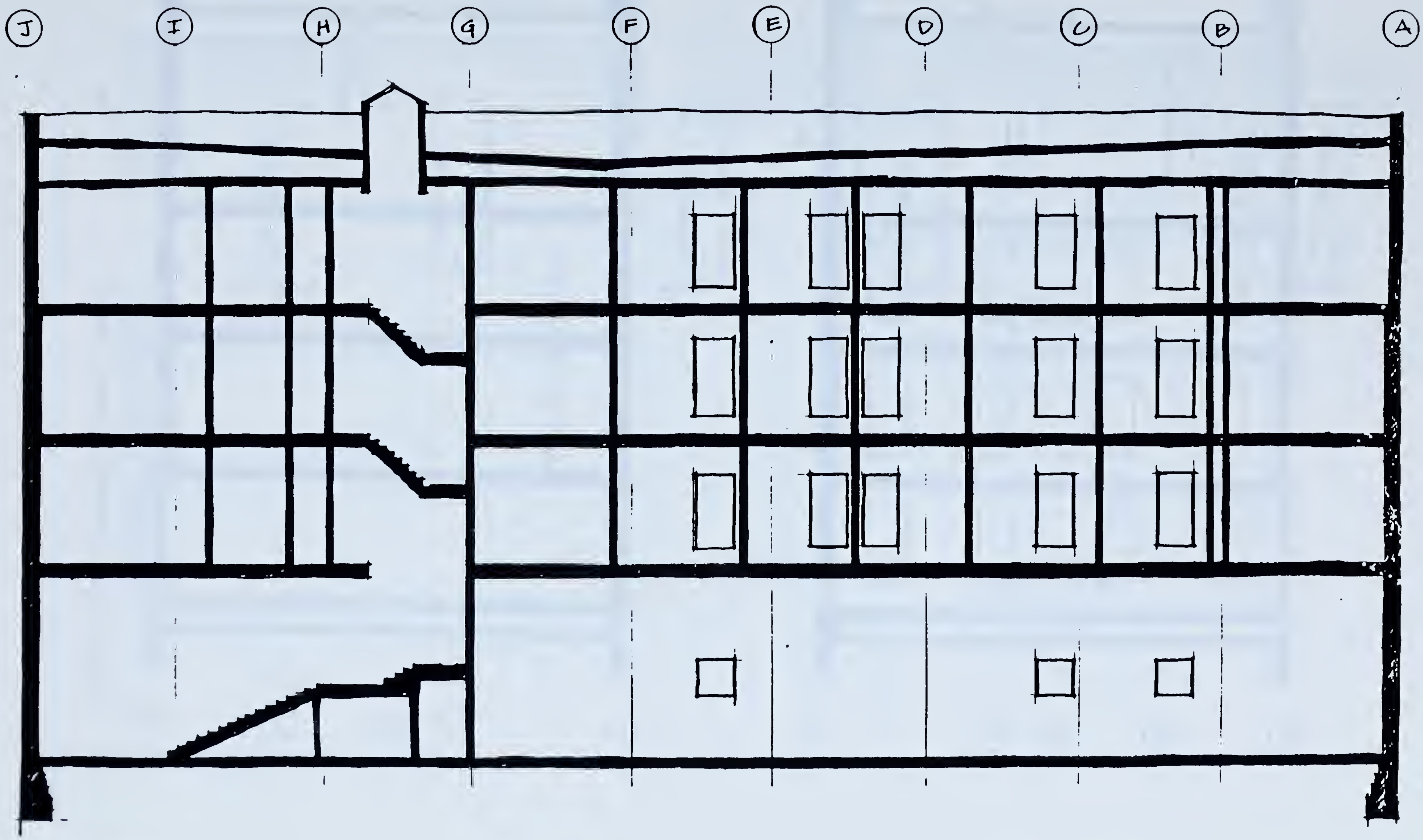
ROOF PLAN

BUILDING #2



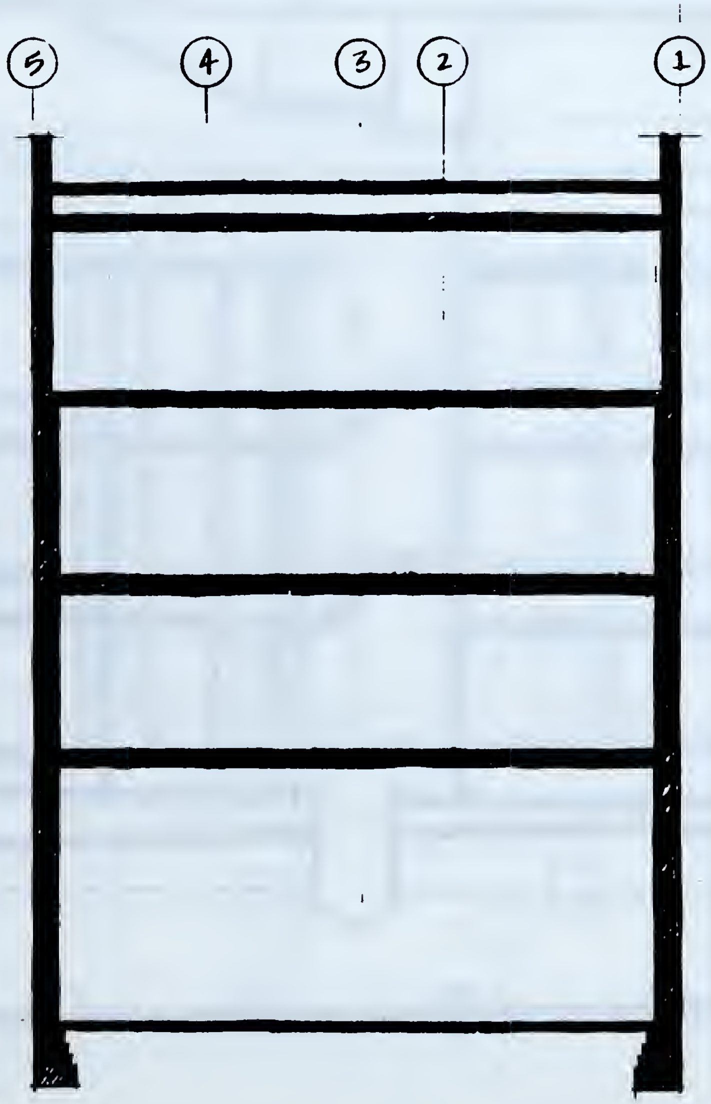
EAST INTERIOR ELEVATION @ LINE 1

BUILDING #2

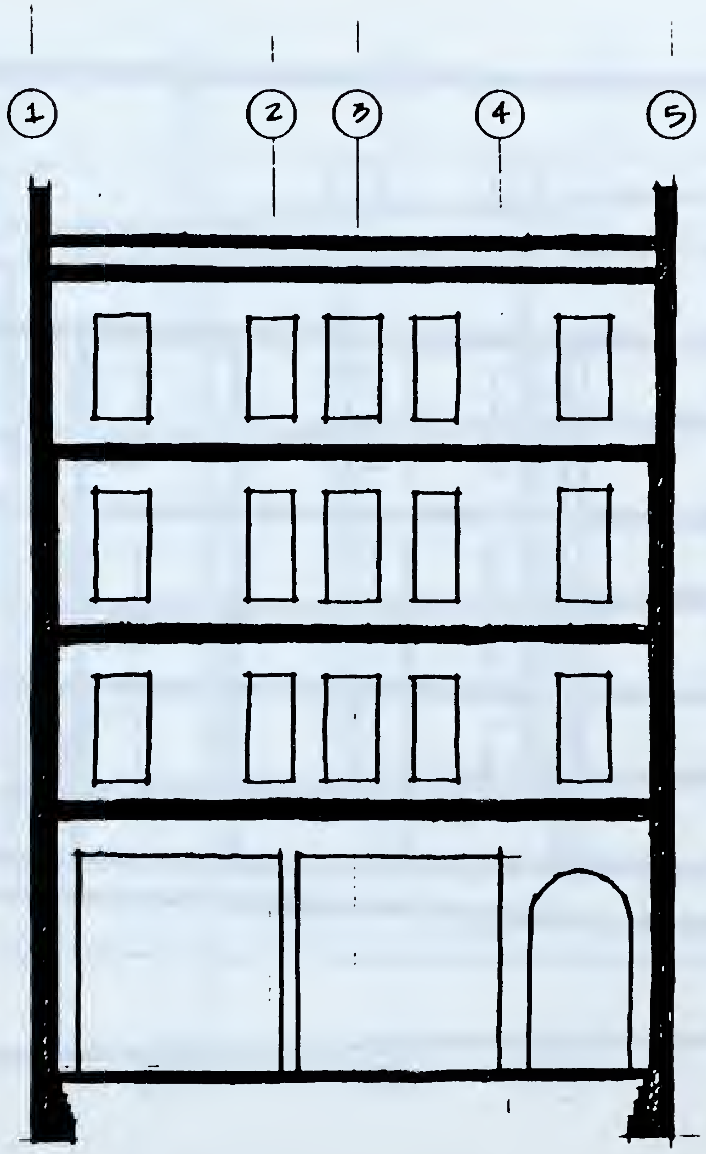


WEST INTERIOR ELEVATION @ LINE 7

BUILDING #2

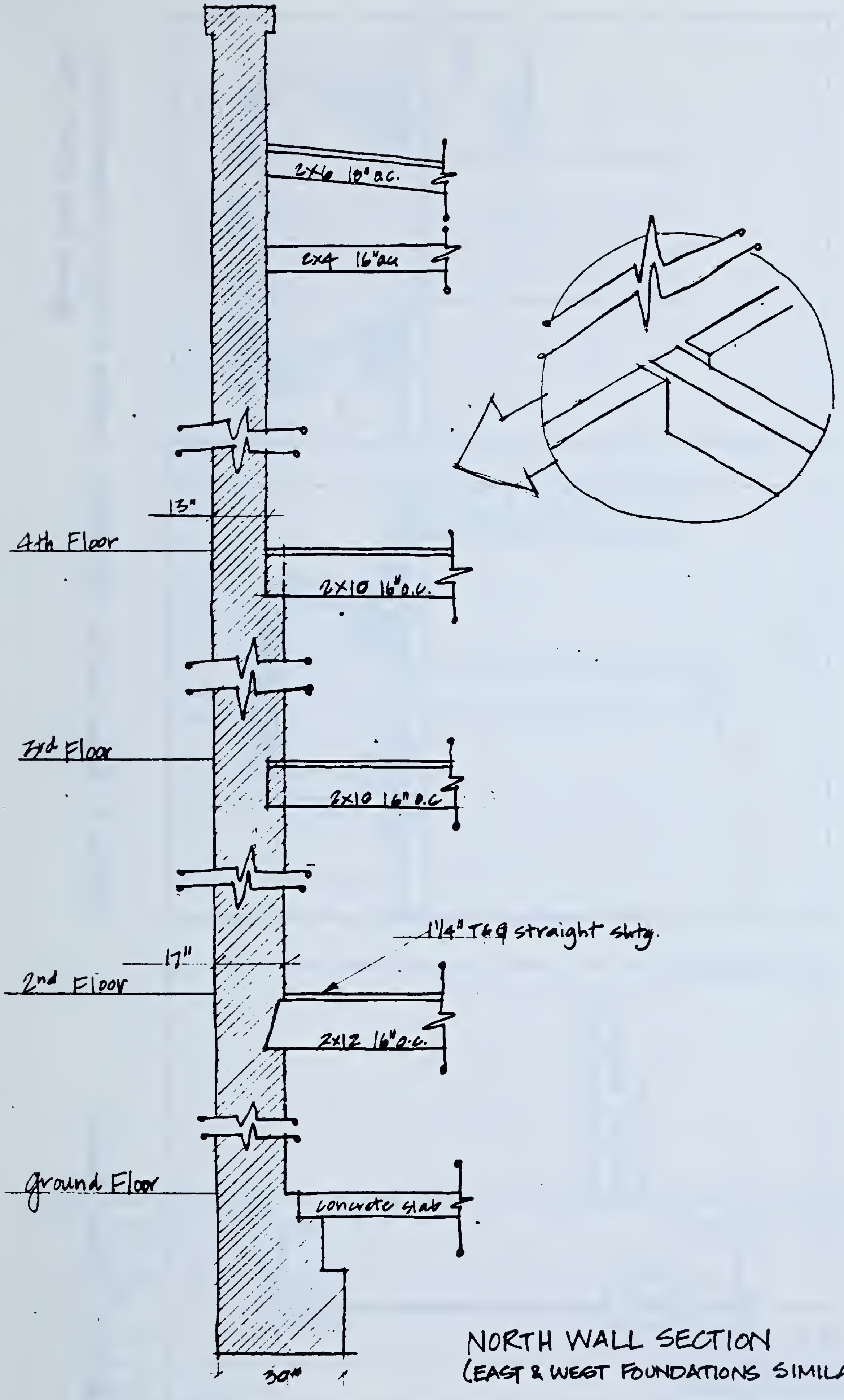


NORTH INTERIOR ELEVATION
@ LINE A



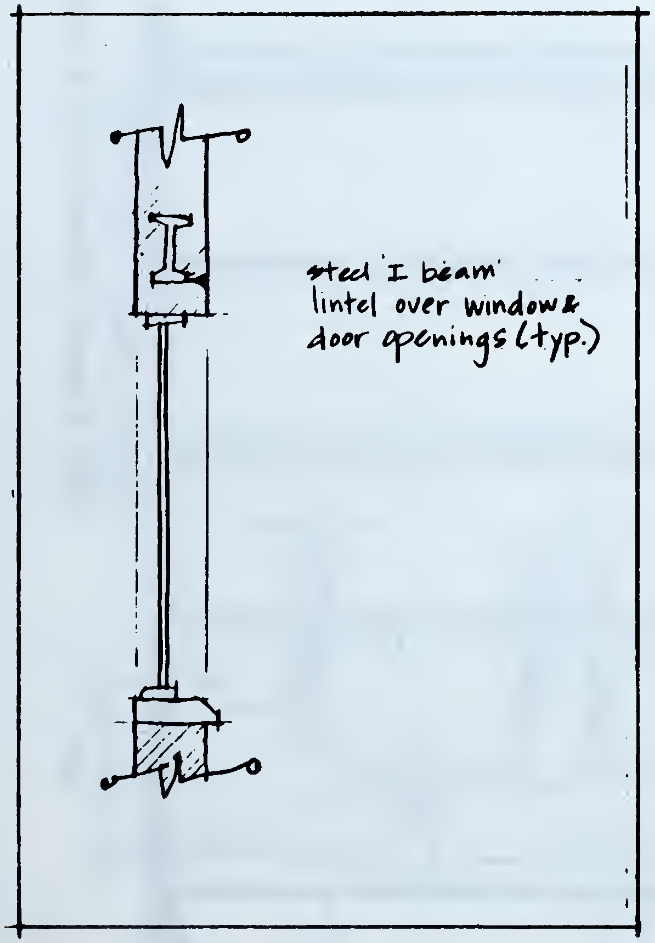
SOUTH INTERIOR ELEVATION
@ LINE J

BUILDING #2

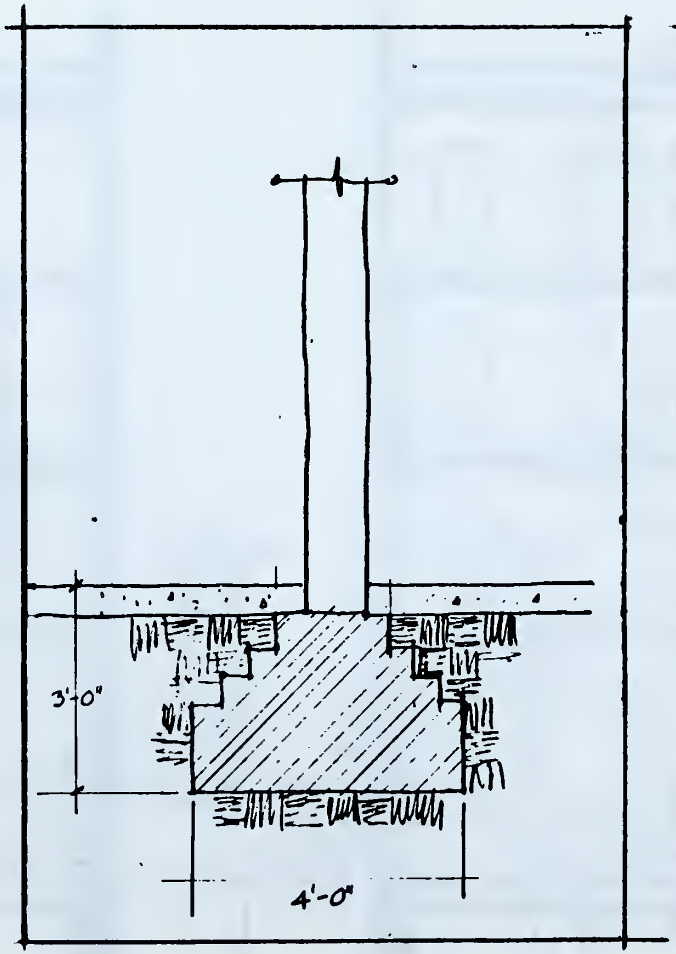


NORTH WALL SECTION
(EAST & WEST FOUNDATIONS SIMILAR)

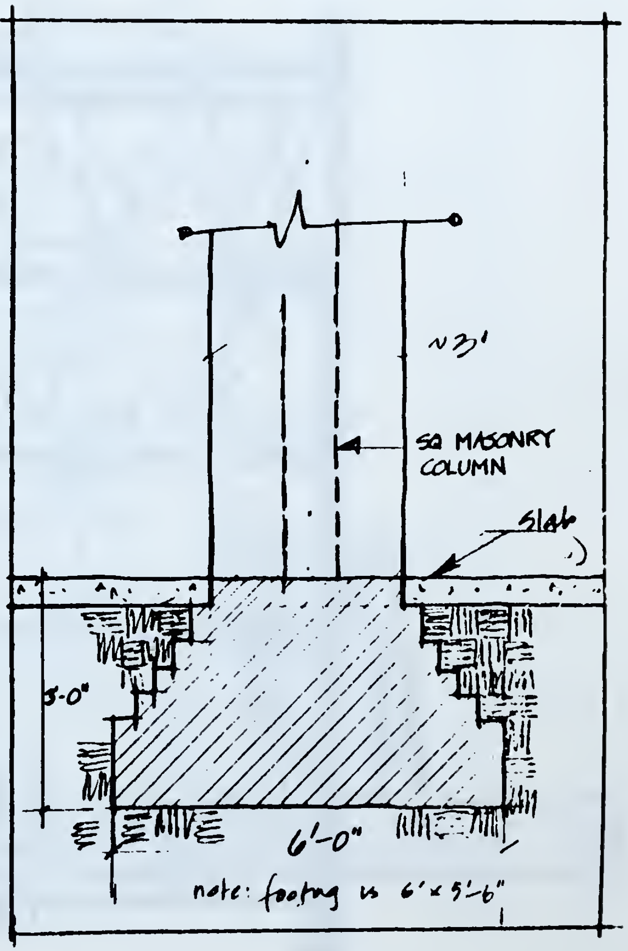
BUILDING #2



DETAIL 1: Typical Opening



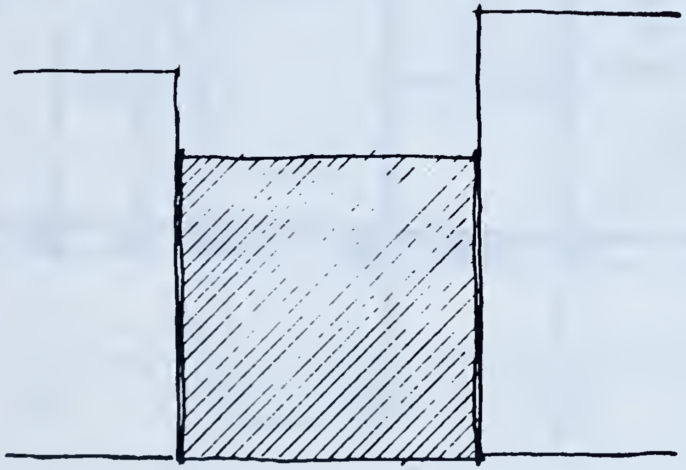
DETAIL 2: Typical Interior Column/Footing



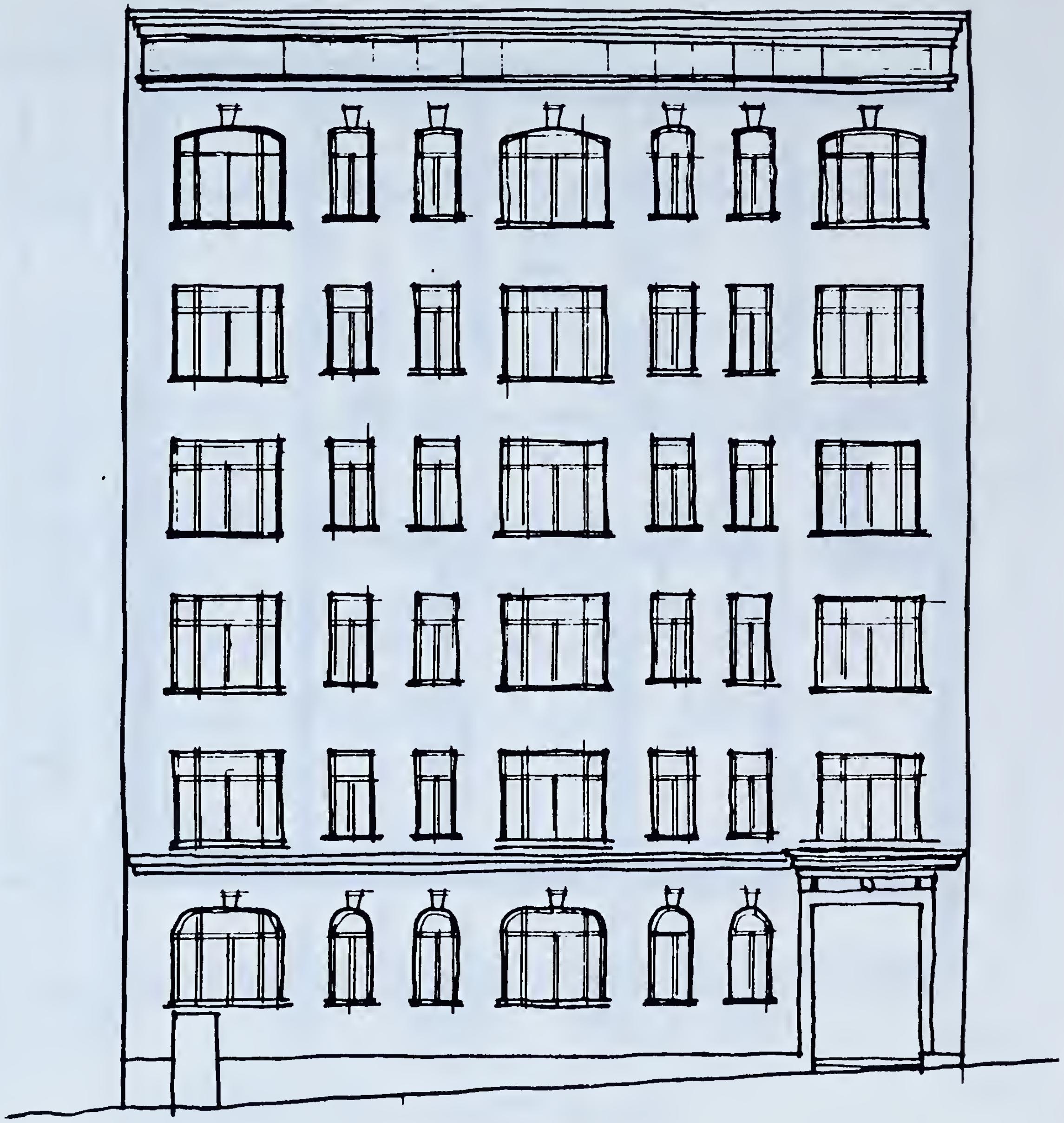
DETAIL 3: Typical Column/Footing Ground Floor @ South Wall

BUILDING #3

Number of Floors: 6	Period: $T = \frac{0.05h_n}{\sqrt{D}}$
Height: 65'-0"	
Width: 54'-6"	Transverse: 0.44 sec.
Length: 53'-4"	Longitudinal: 0.44 sec.

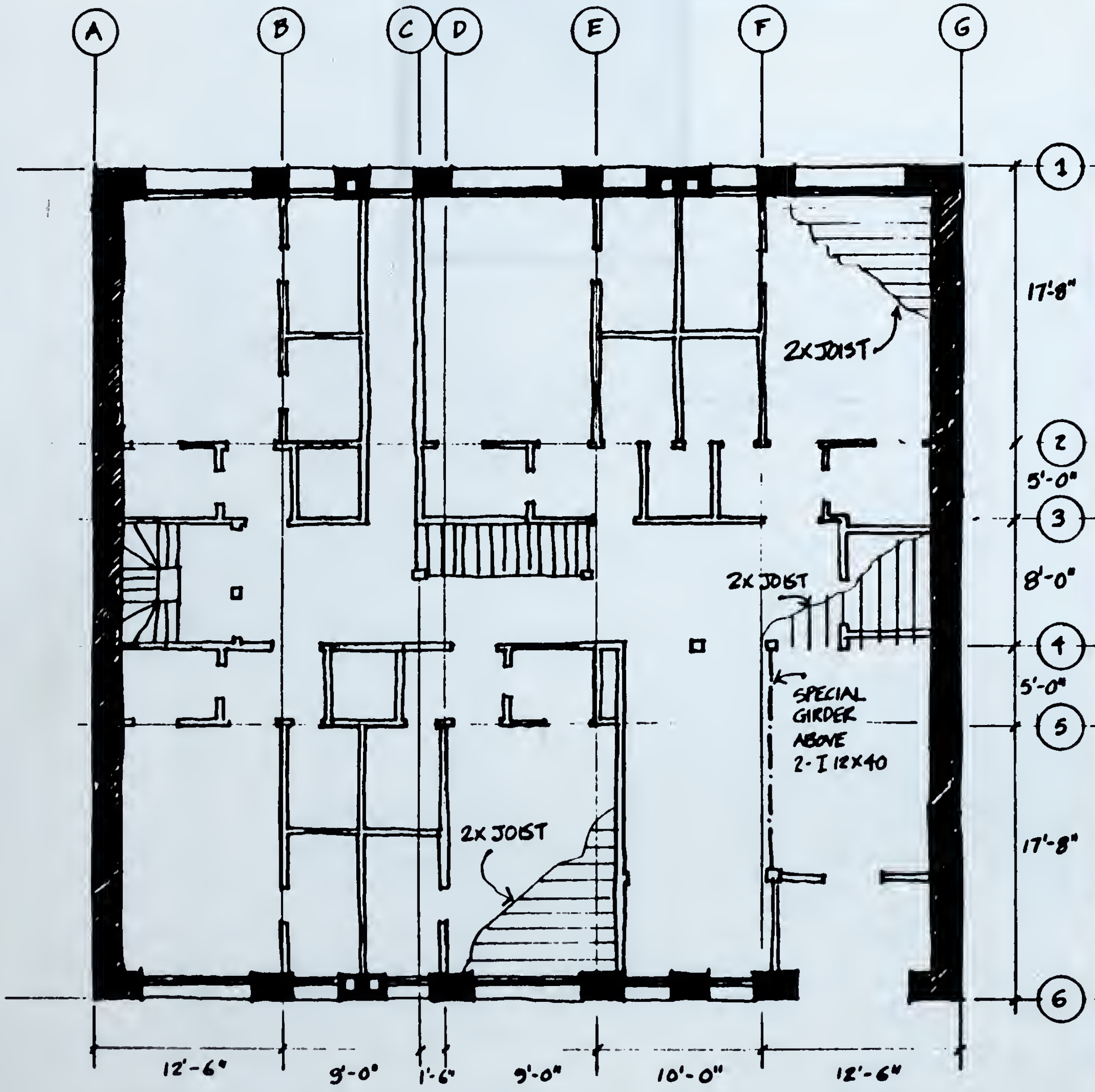


ADJACENT BLDG DIAGRAM

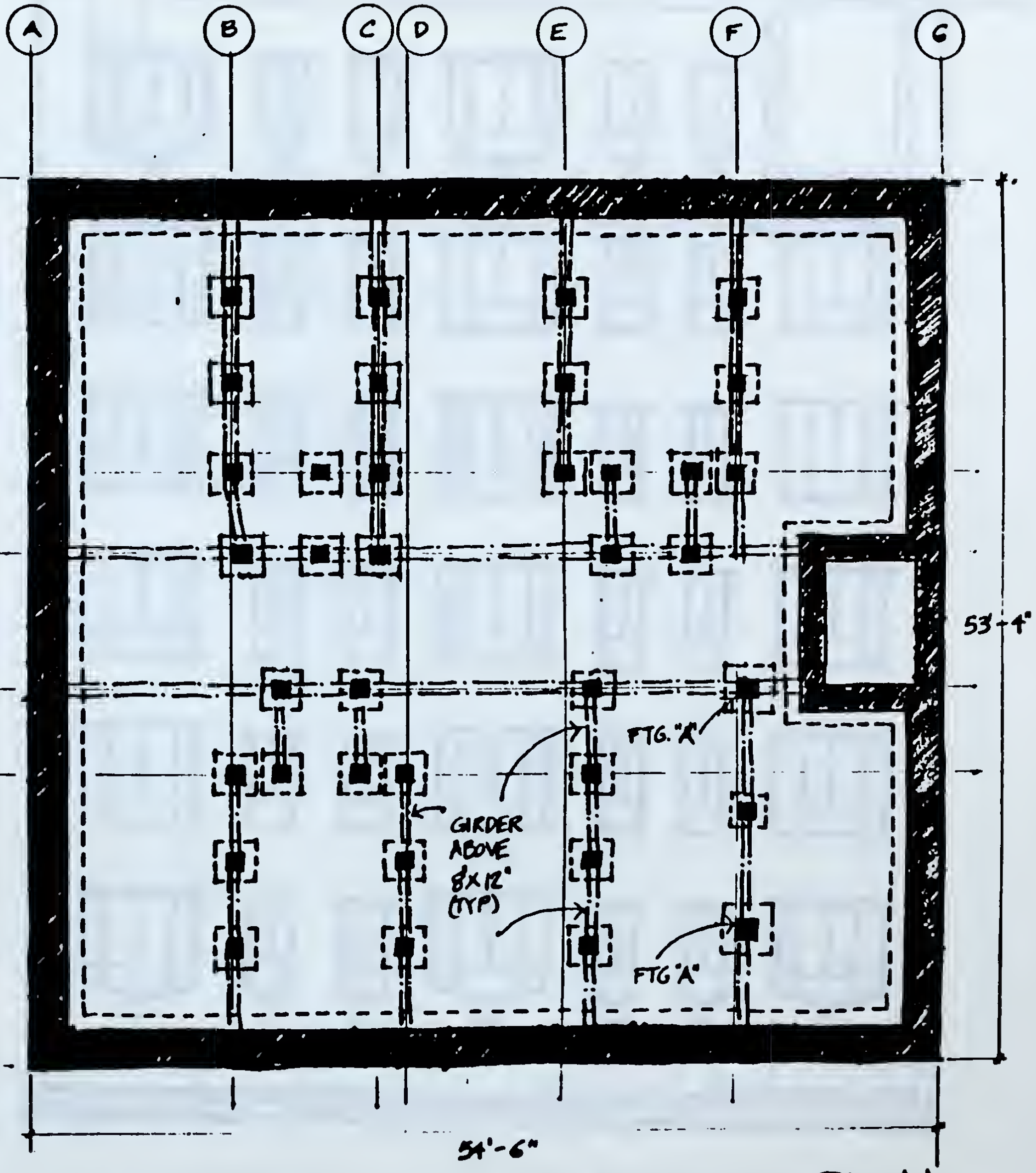


FRONT ELEVATION

BUILDING #3

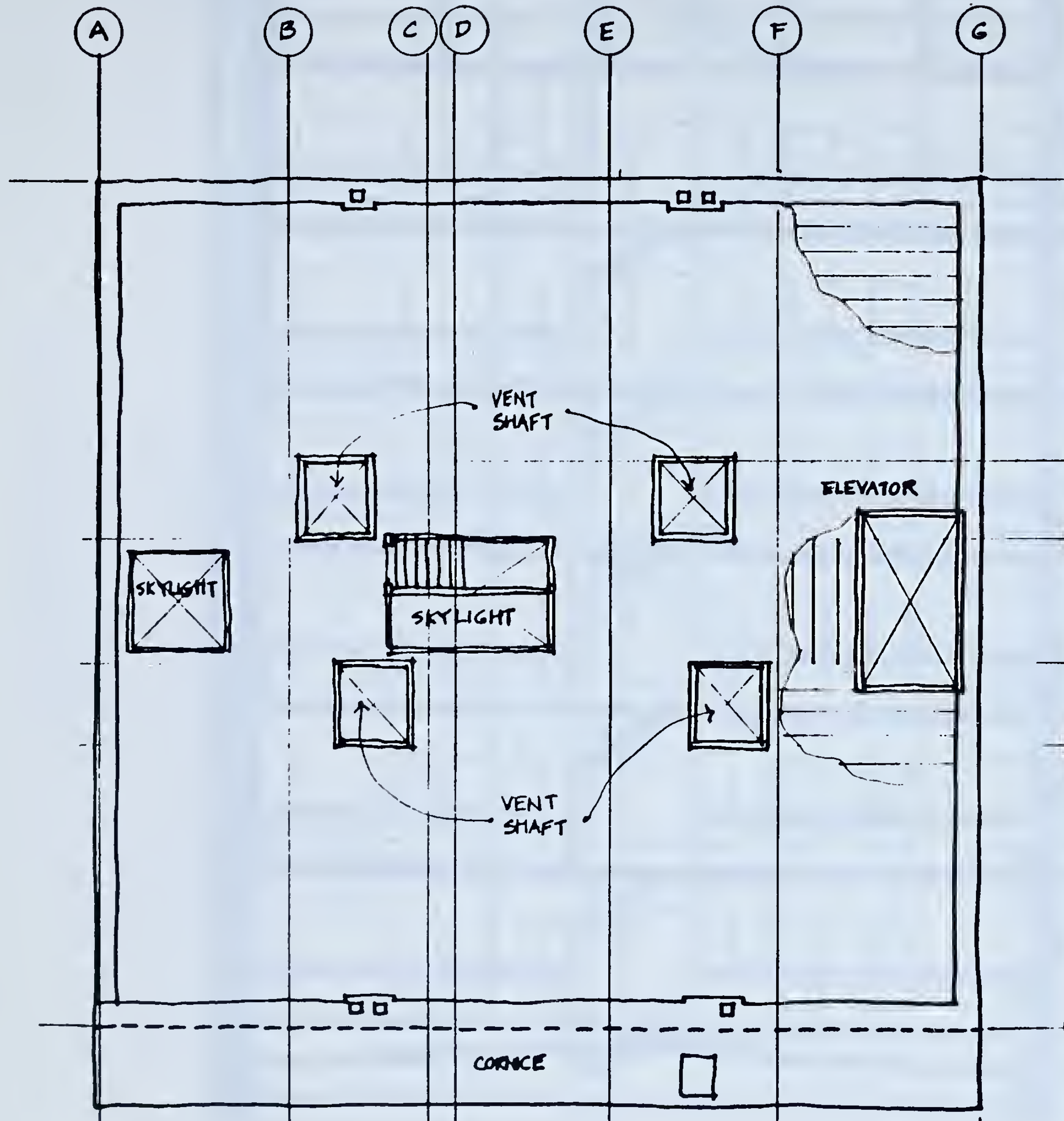


GROUND FLOOR PLAN

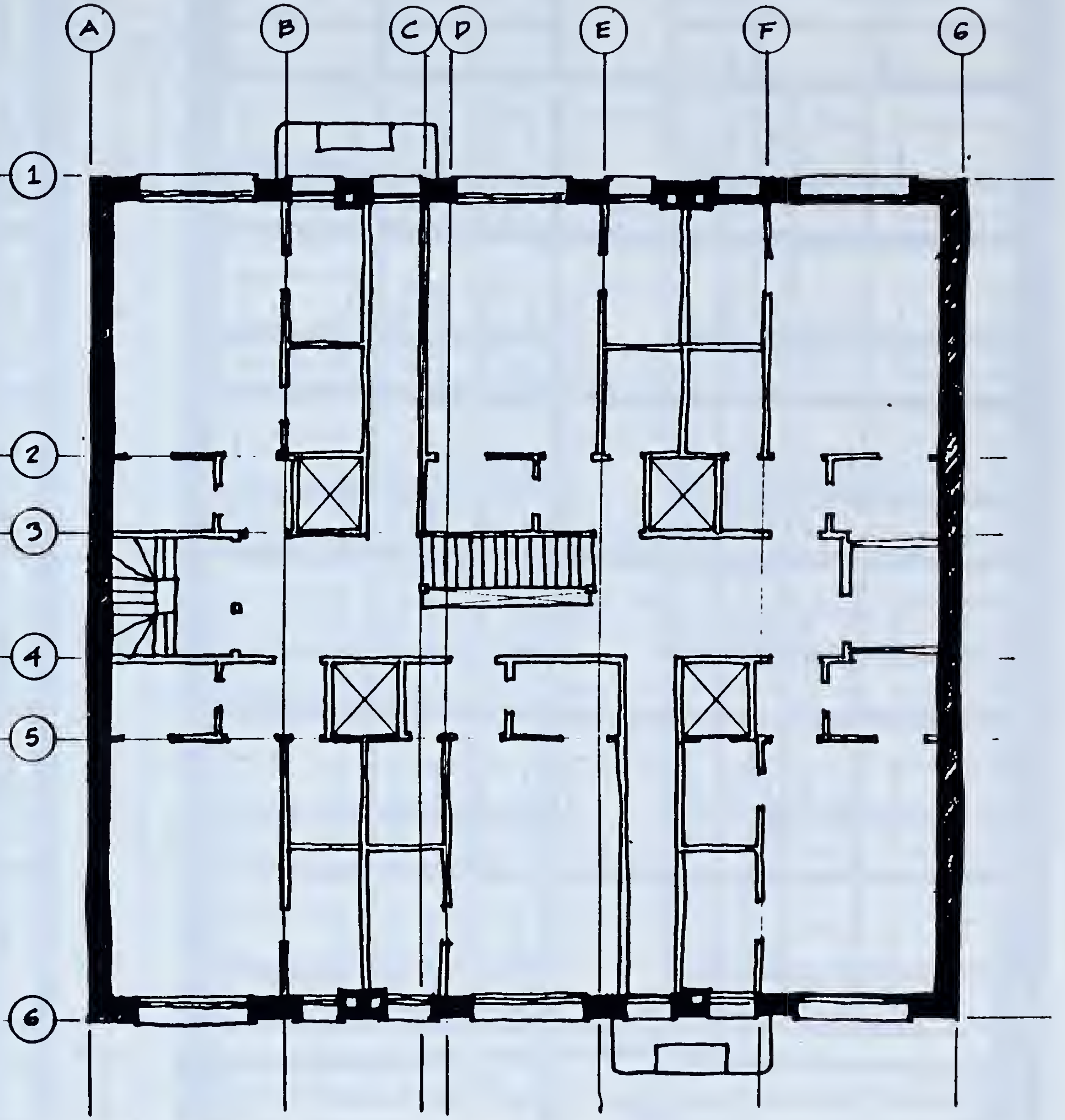


FOUNDATION PLAN / BASEMENT PLAN

BUILDING #3

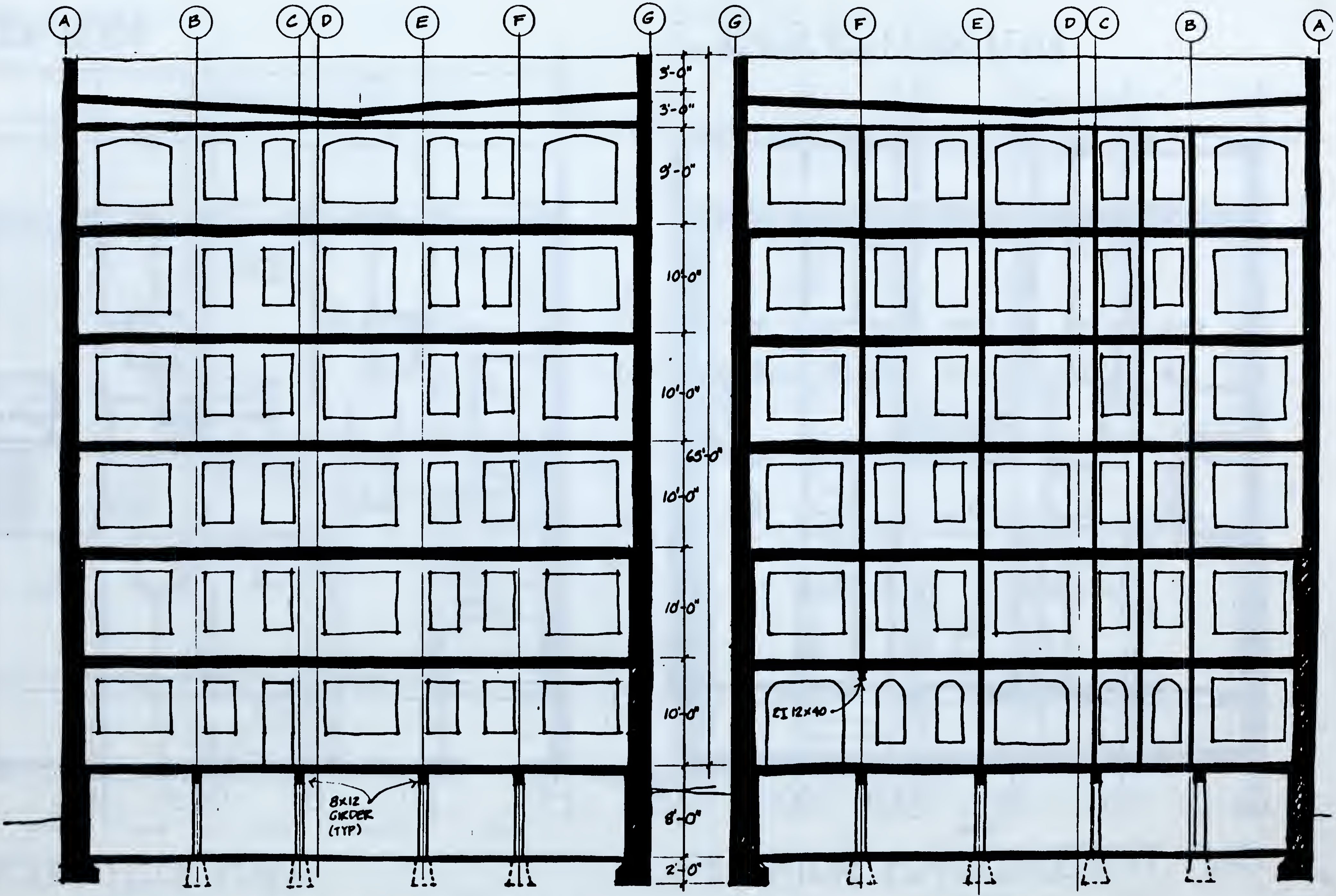


ROOF PLAN



2nd, 3rd, 4th, 5th, 6th FLOOR PLAN

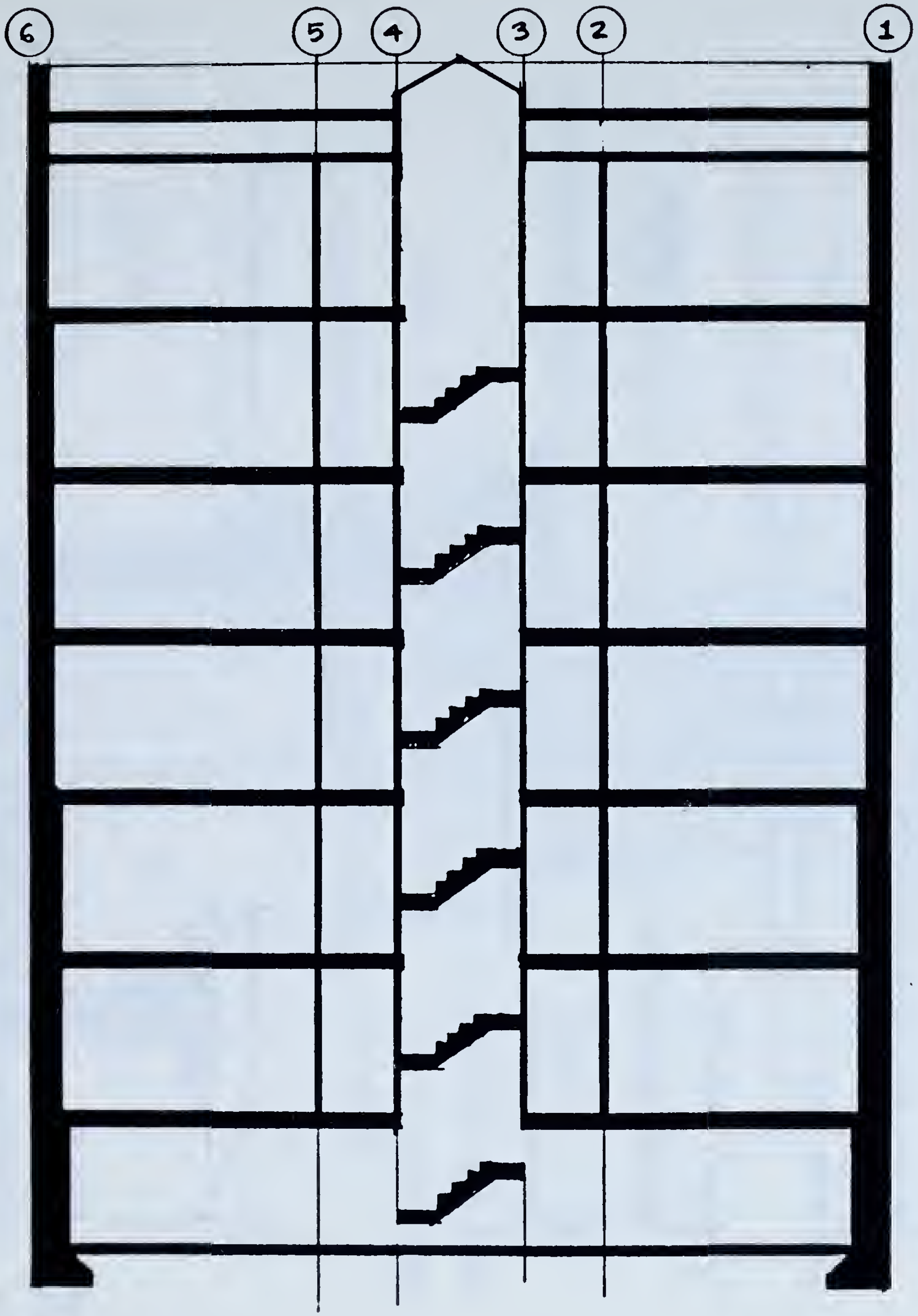
BUILDING #3



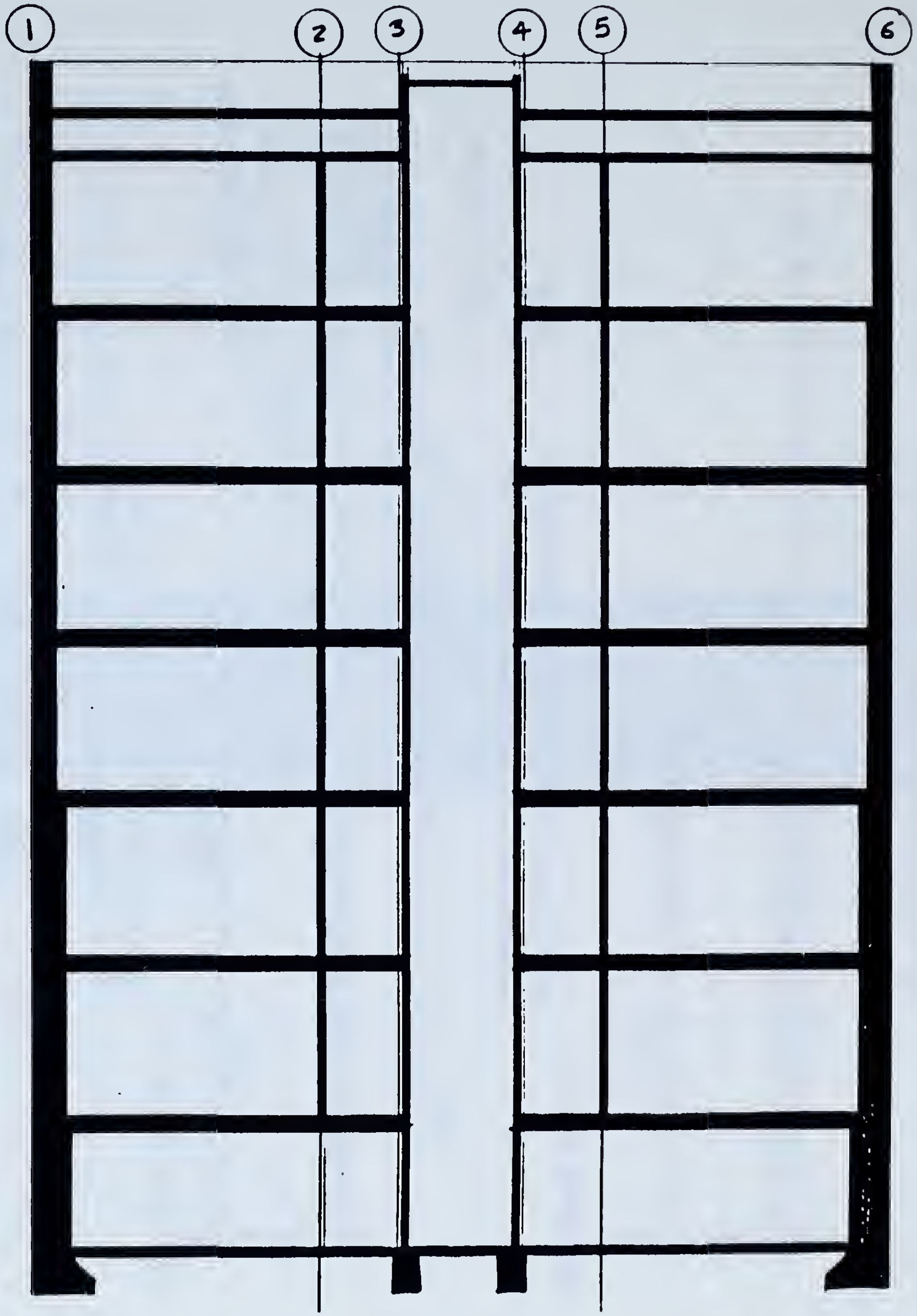
SOUTH WALL INTERIOR ELEVATION @ LINE 1

NORTH' WALL INTERIOR ELEVATION @ LINE 6

BUILDING #3

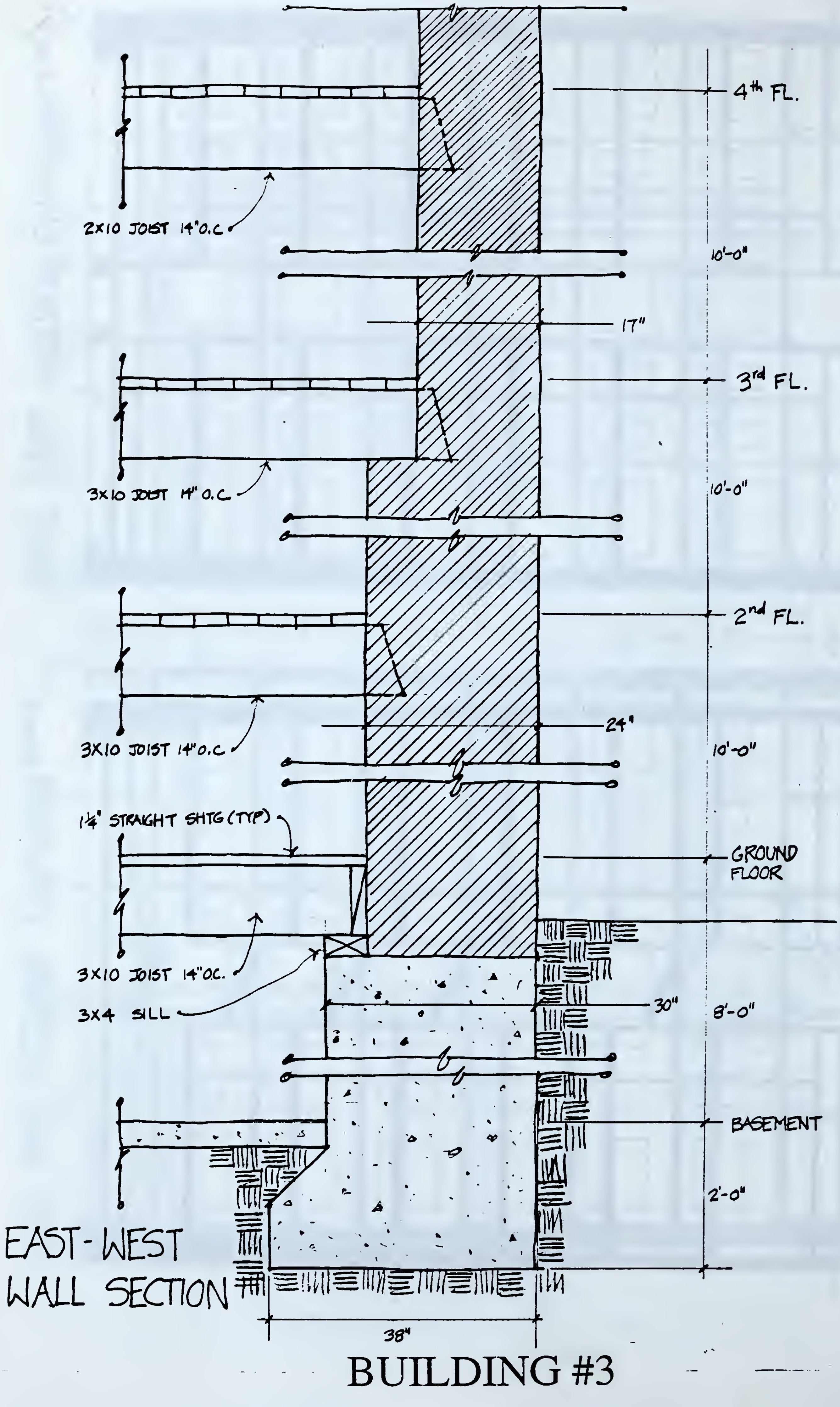


EAST WALL INTERIOR ELEVATION @ LINE A

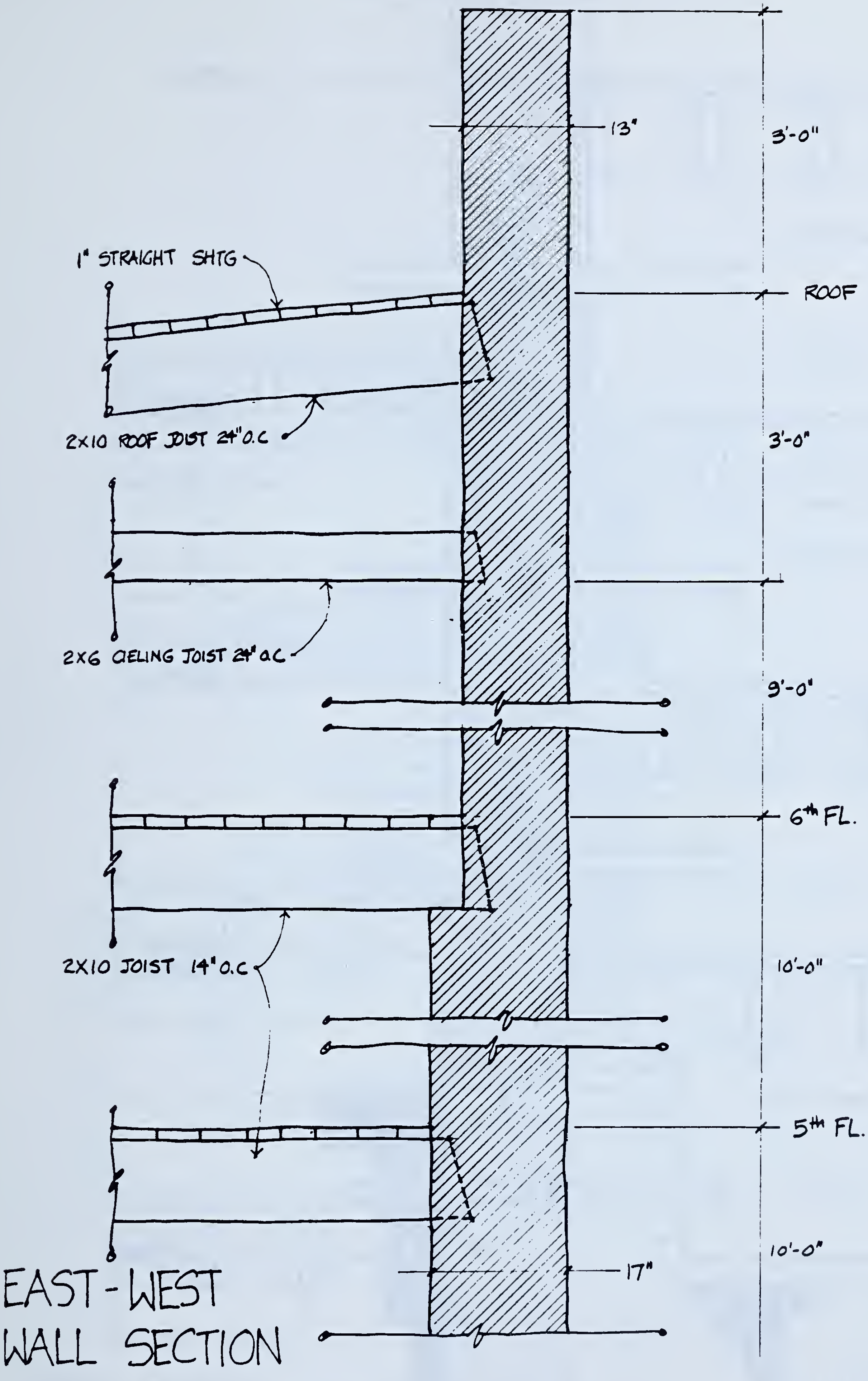


WEST WALL INTERIOR ELEVATION @ LINE G

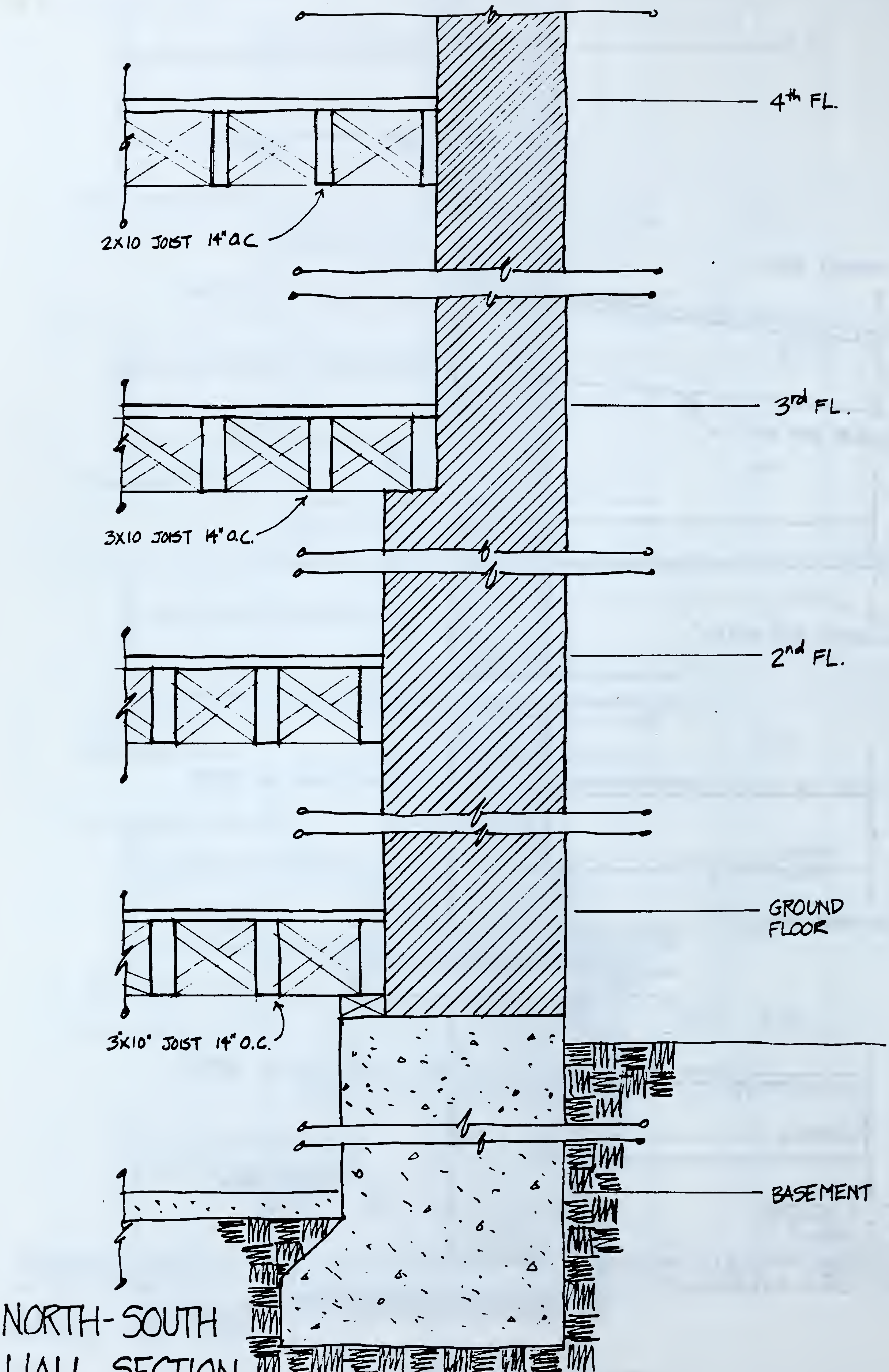
BUILDING #3


4th FL.
2X10 JOIST 14"O.C.
10'-0"
17"
3rd FL.
3X10 JOIST 14" O.C.
10'-0"
2nd FL.
3X10 JOIST 14"O.C.
24"
10'-0"
1¼" STRAIGHT SHTG (TYP)
GROUND FLOOR
3X10 JOIST 14"O.C.
3X4 SILL
30"
8'-0"
BASEMENT
2'-0"
EAST-WEST WALL SECTION
38"

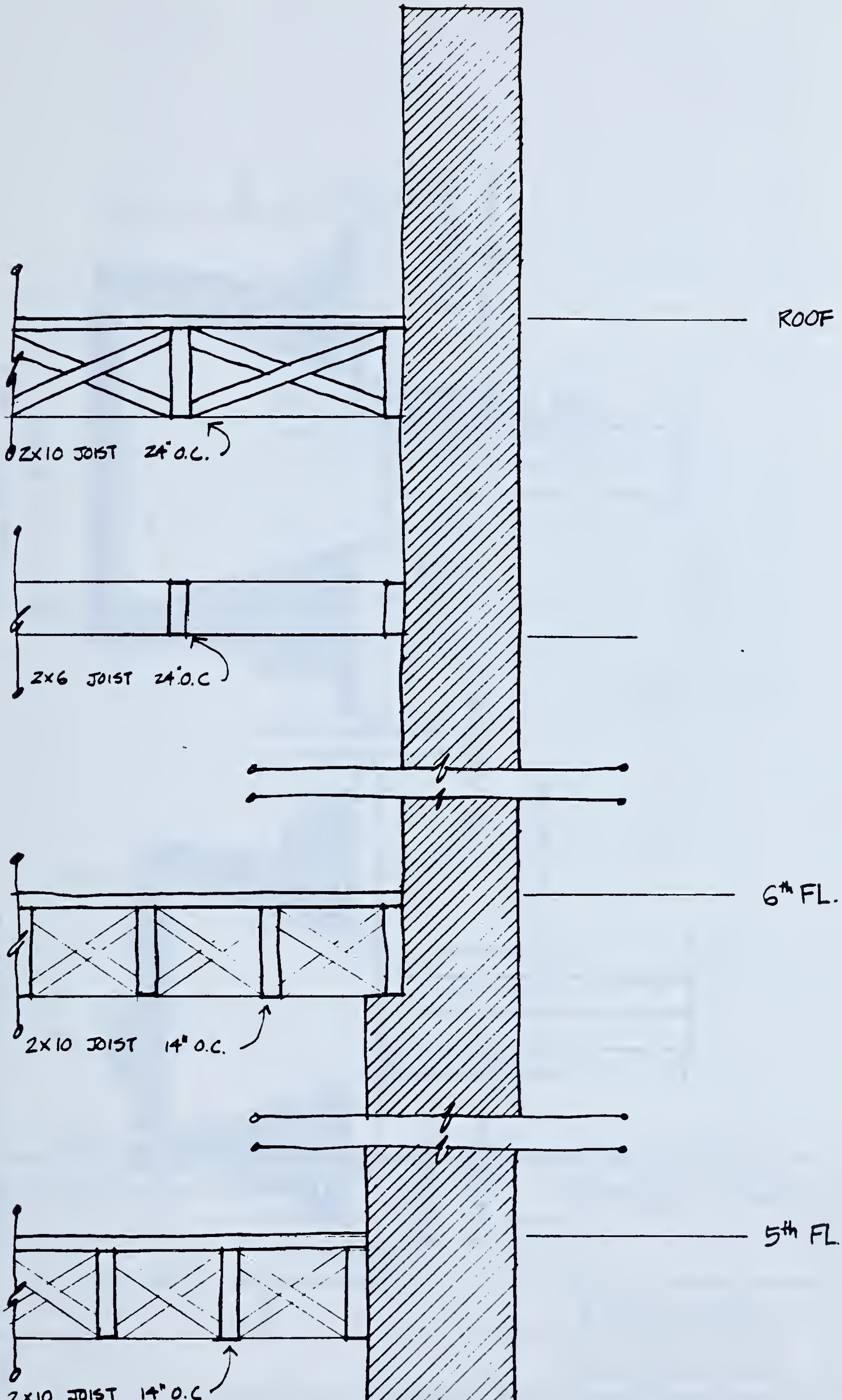
BUILDING #3


13"
3'-0"
1" STRAIGHT SHTG
ROOF
2X10 ROOF JOIST 24" O.C
3'-0"
2X6 CIELING JOIST 24" O.C
9'-0"
6th FL.
2X10 JOIST 14" O.C
10'-0"
5th FL.
10'-0"
17"
EAST-WEST
WALL SECTION

BUILDING #3

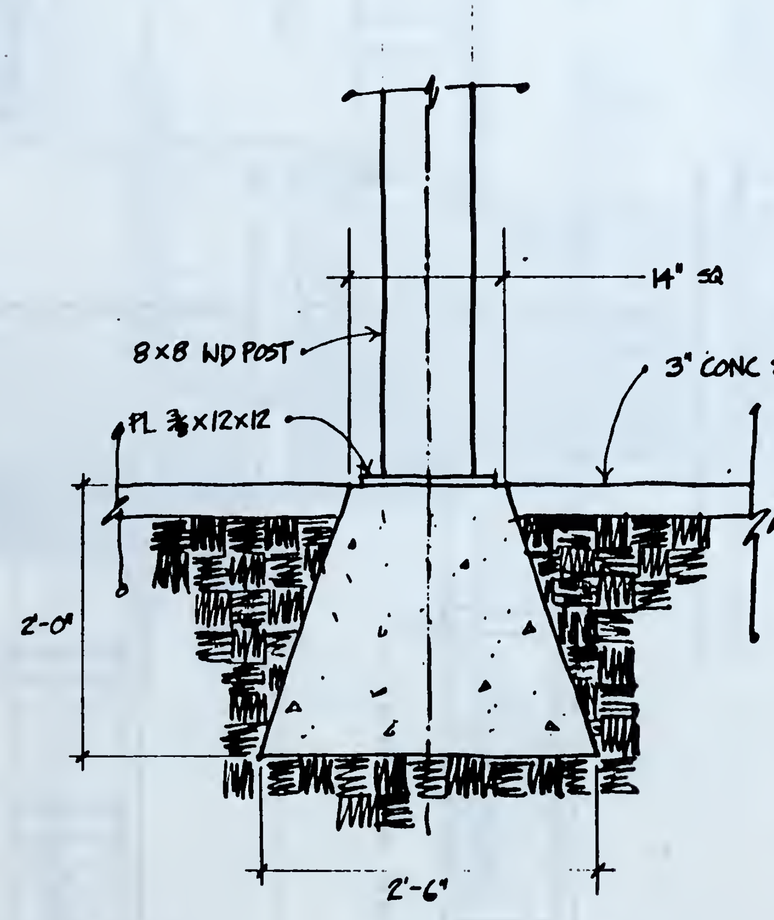

4th FL.
2X10 JOIST 14" O.C.
3rd FL.
3X10 JOIST 14" O.C.
2nd FL.
GROUND FLOOR
3"X10" JOIST 14" O.C.
BASEMENT
NORTH-SOUTH WALL SECTION

BUILDING #3

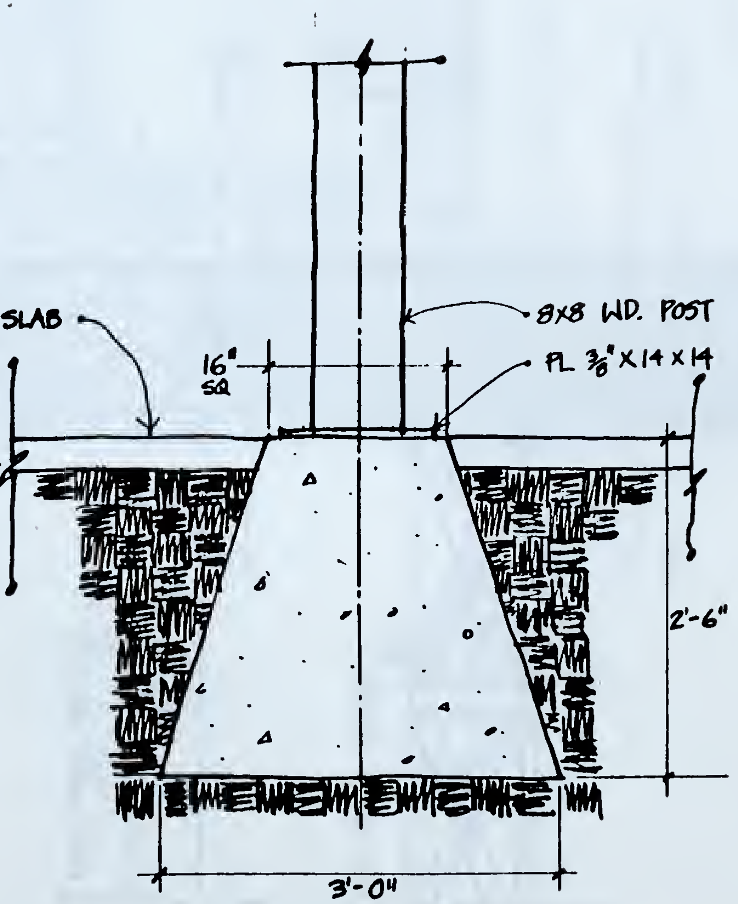


NORTH-SOUTH
WALL SECTION

BUILDING #3



TYP. INT. FOOTING

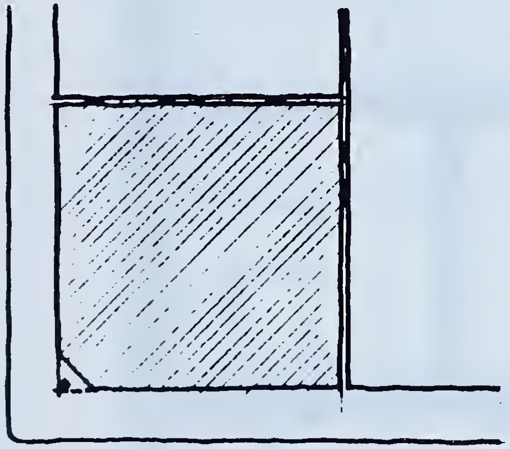


FOOTING "A"

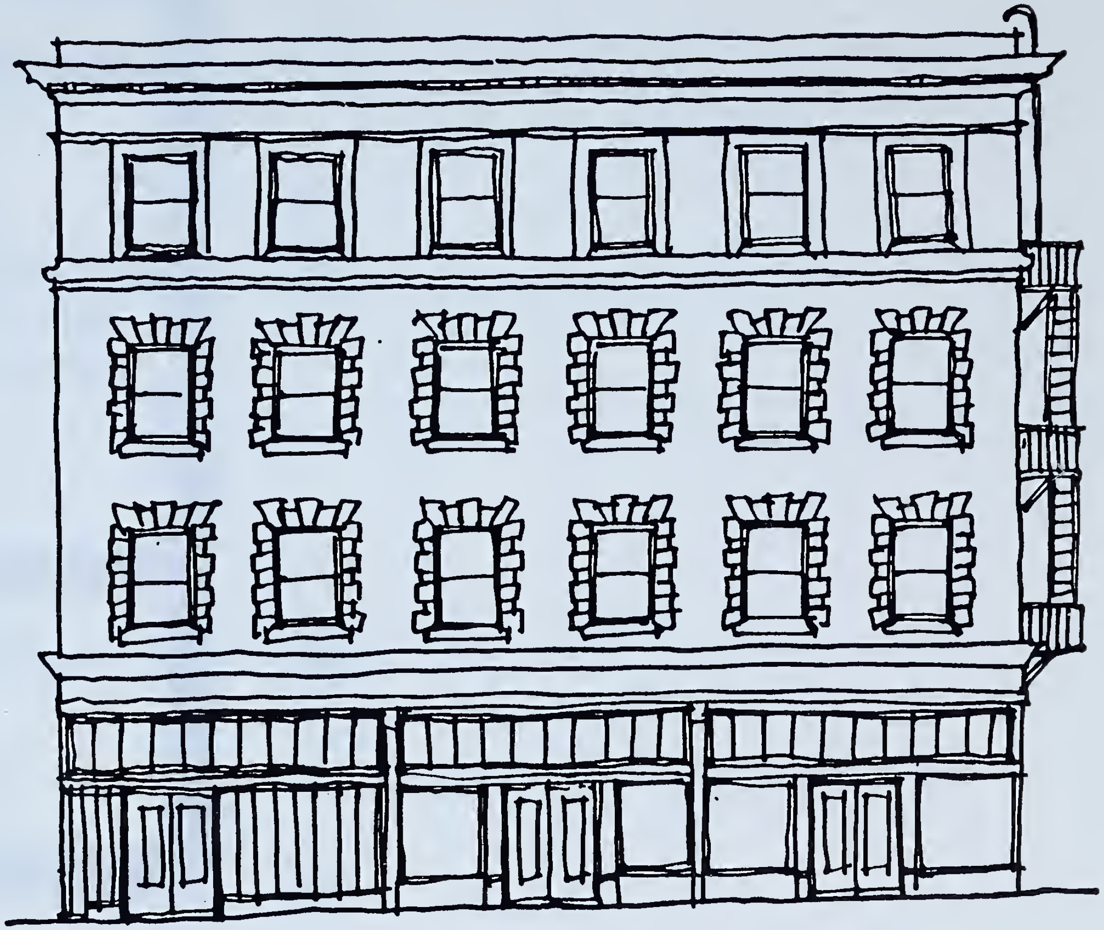
BUILDING #3

BUILDING #4

Number of Floors: 4	Period: $T = \frac{0.05h_n}{\sqrt{D}}$
Height: 50'-0"	
Width: 56'-0"	Transverse: 0.34 sec.
Length: 54'-7"	Longitudinal: 0.34 sec.

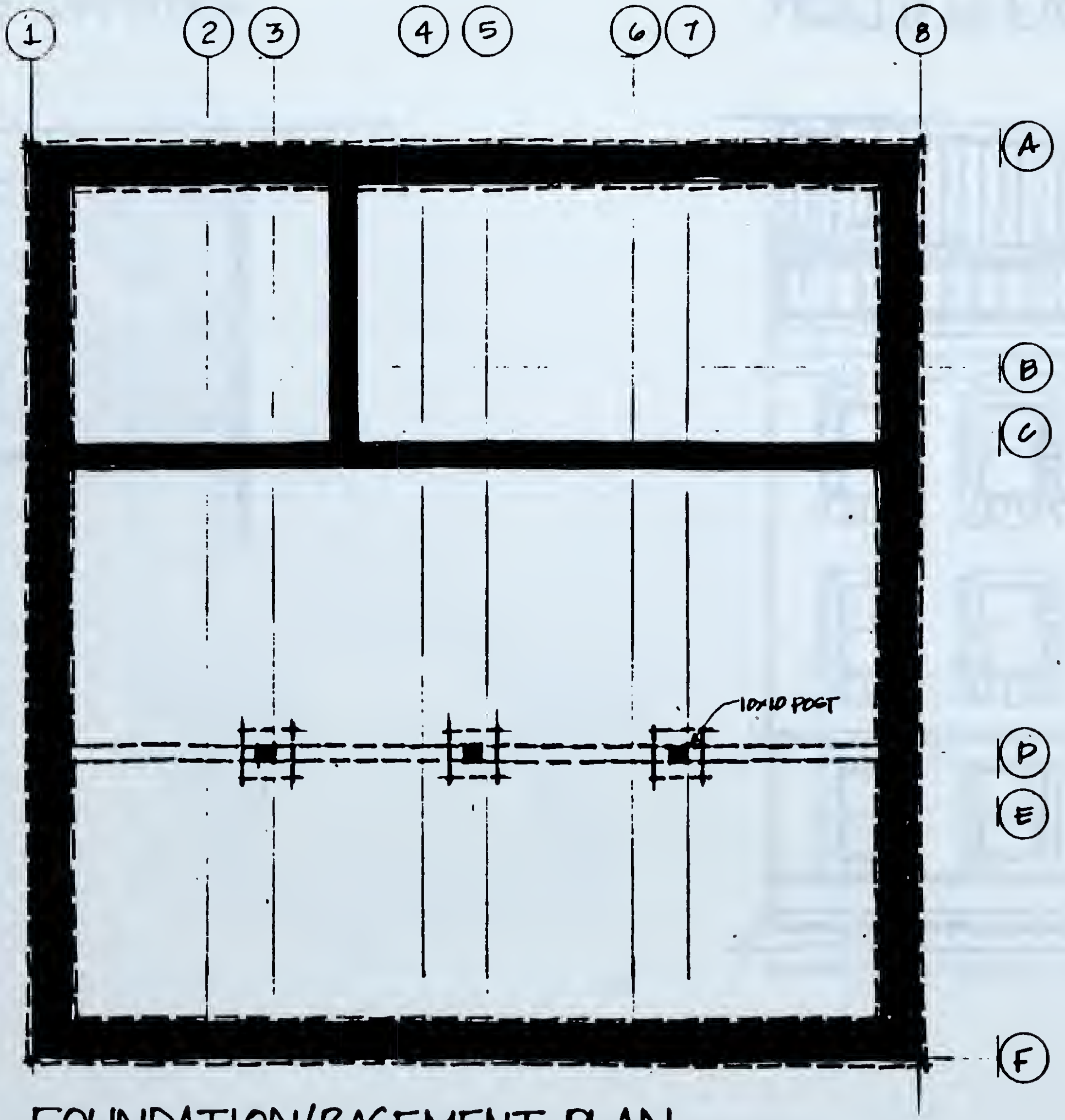


SITE DIAGRAM



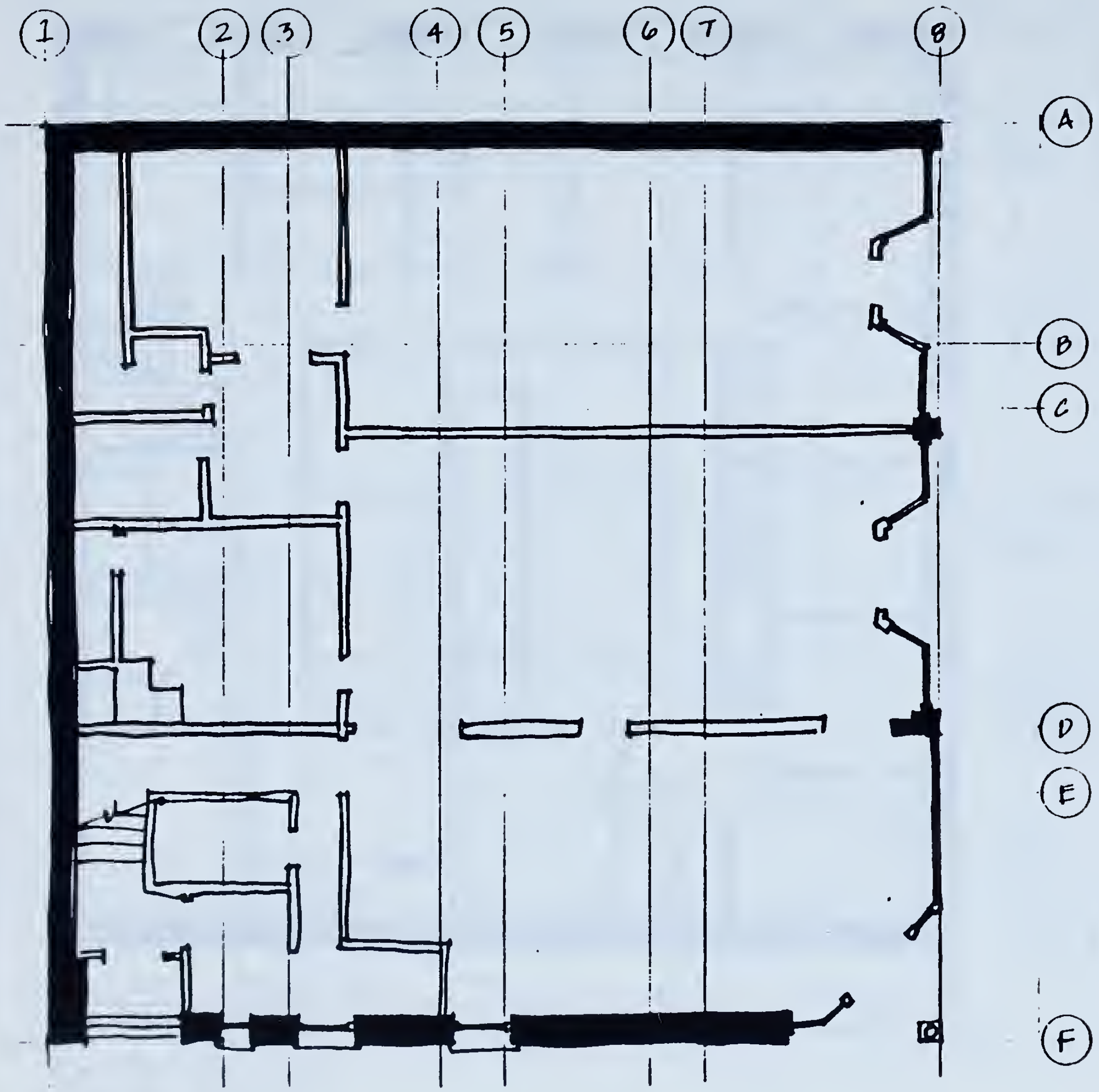
NORTH ELEVATION

BUILDING #4



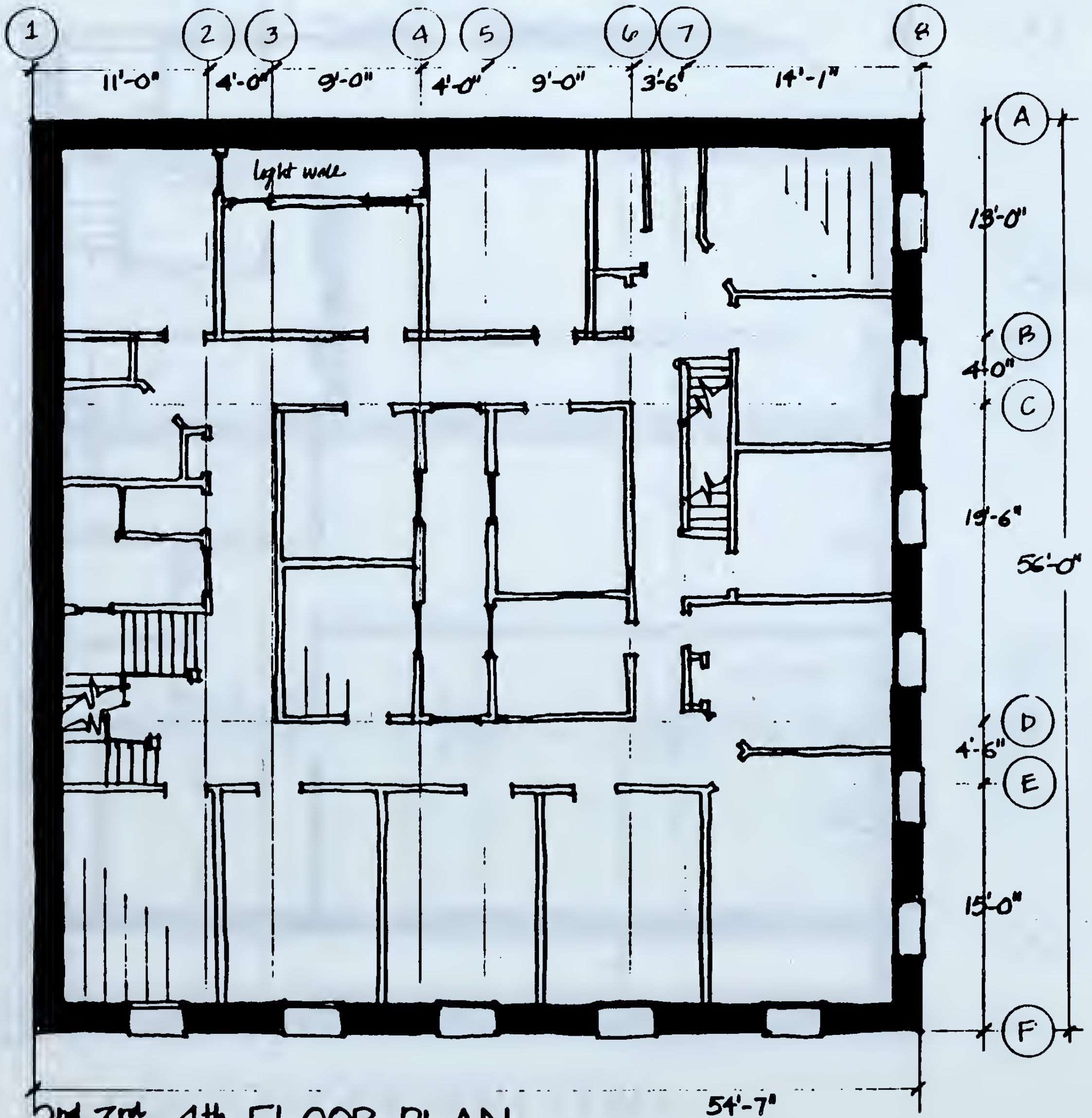
FOUNDATION/BASEMENT PLAN

BUILDING #4



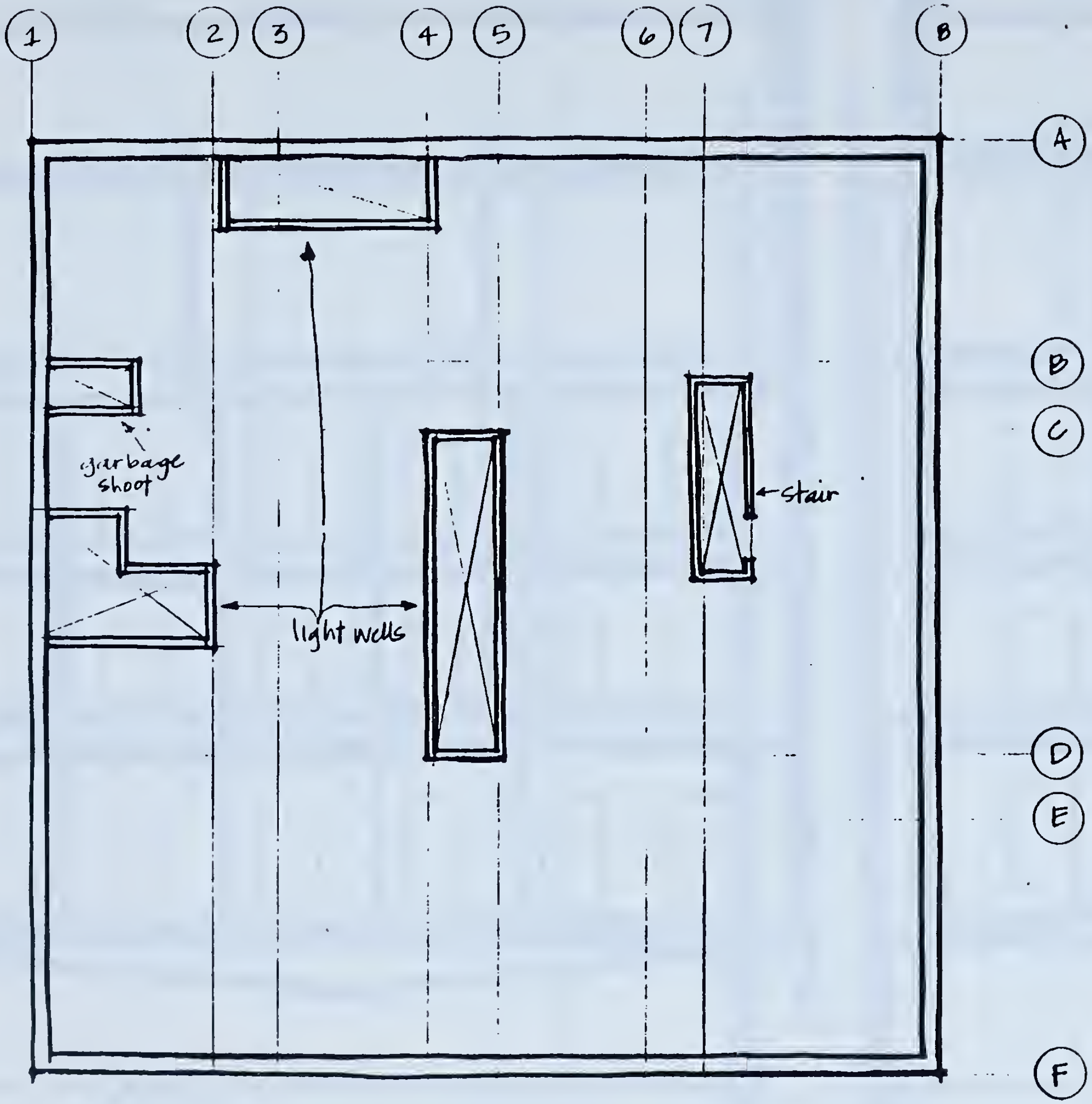
GROUND FLOOR

BUILDING #4



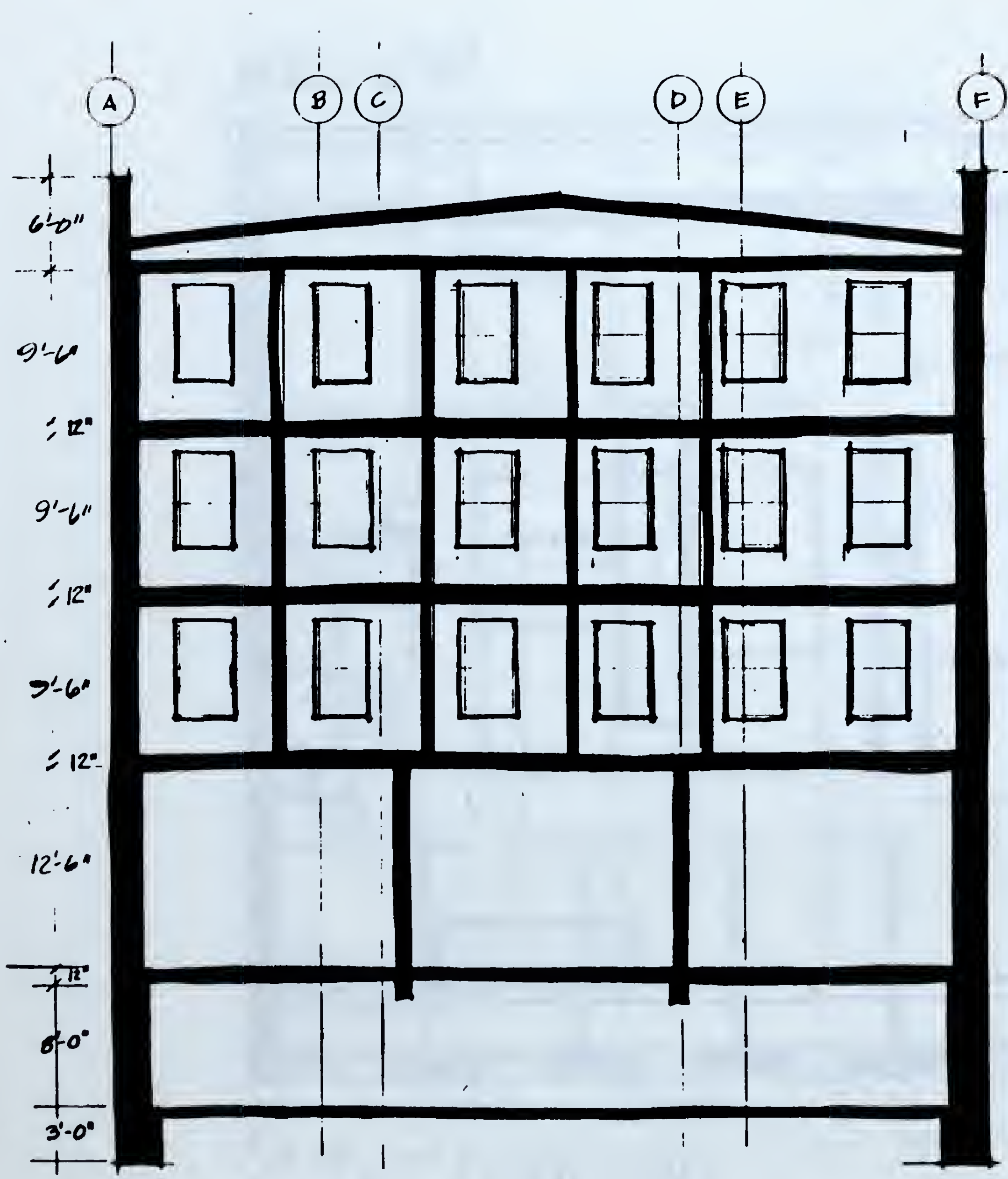
2nd, 3rd & 4th FLOOR PLAN

BUILDING #4

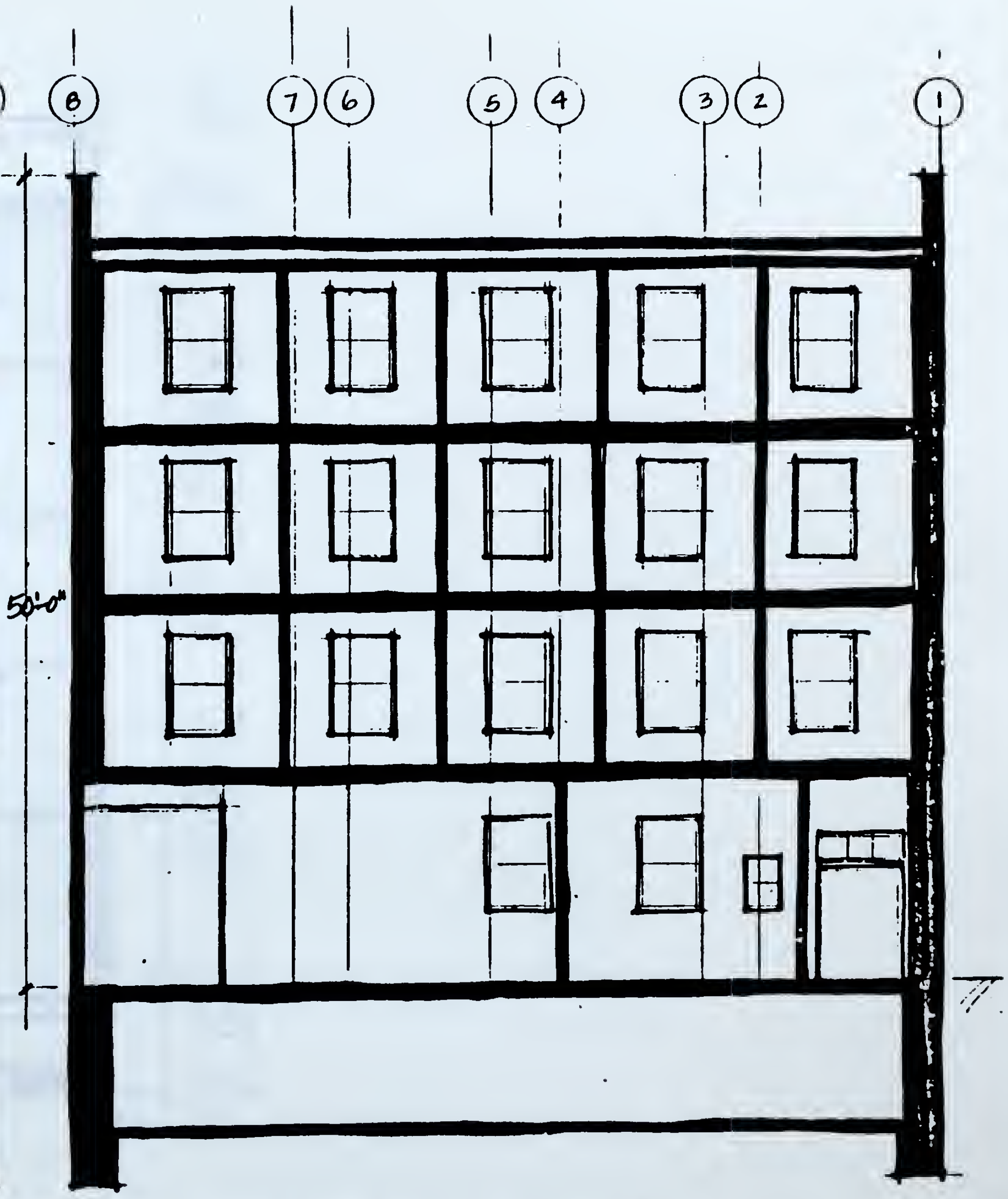


ROOF PLAN

BUILDING #4

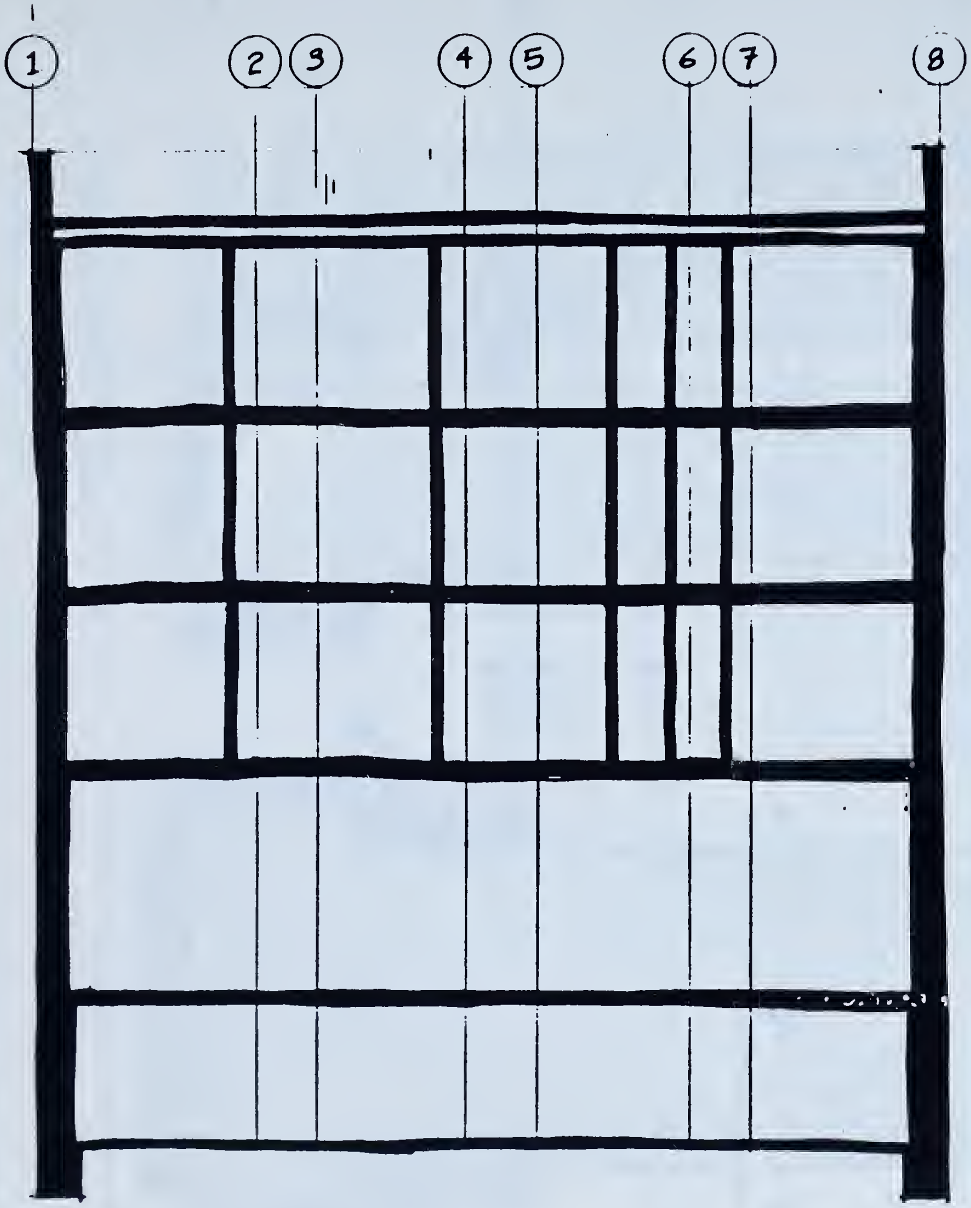


NORTH INTERIOR ELEVATION @LINE B

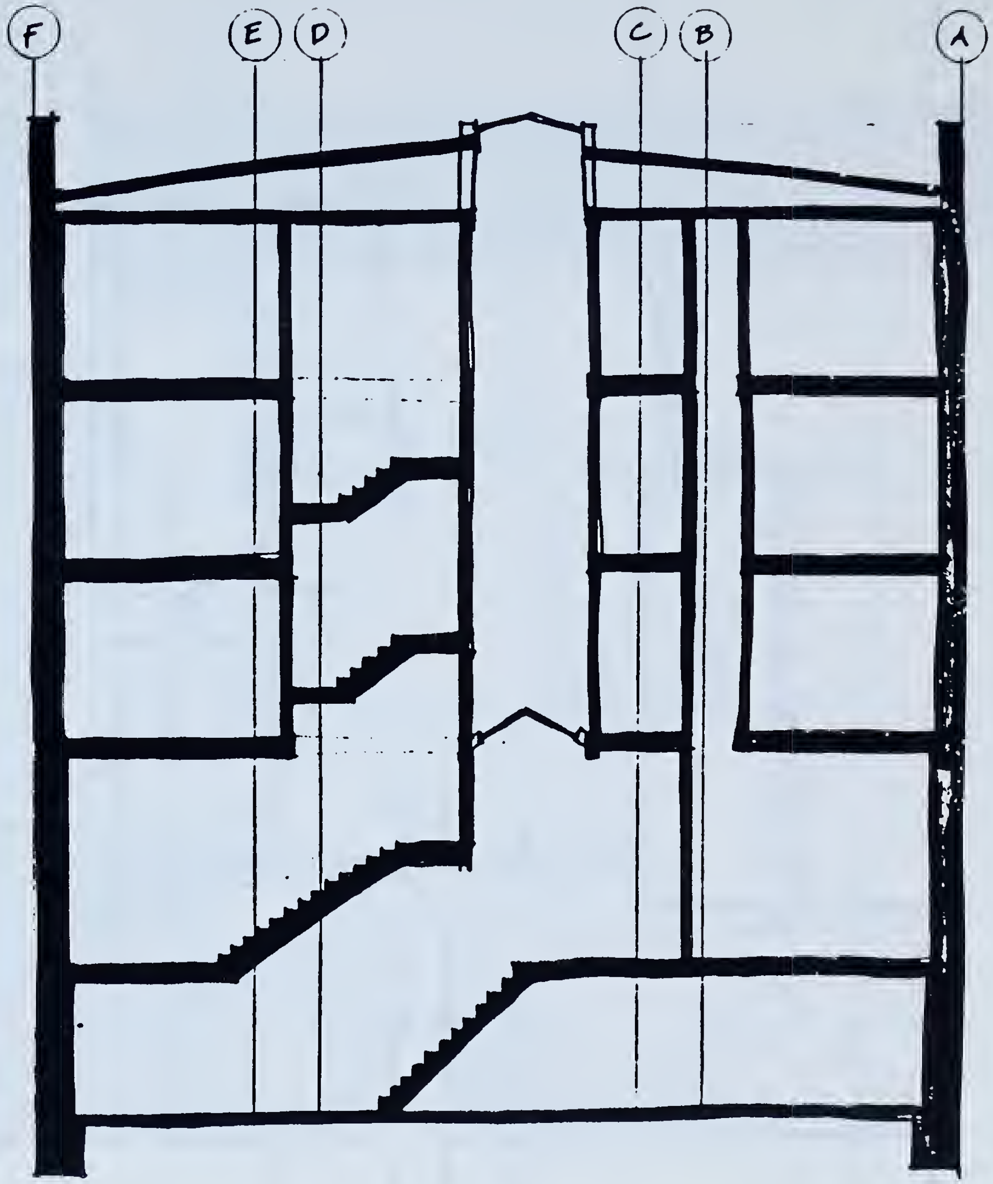


EAST. INTERIOR ELEVATION @LINE F

BUILDING #4

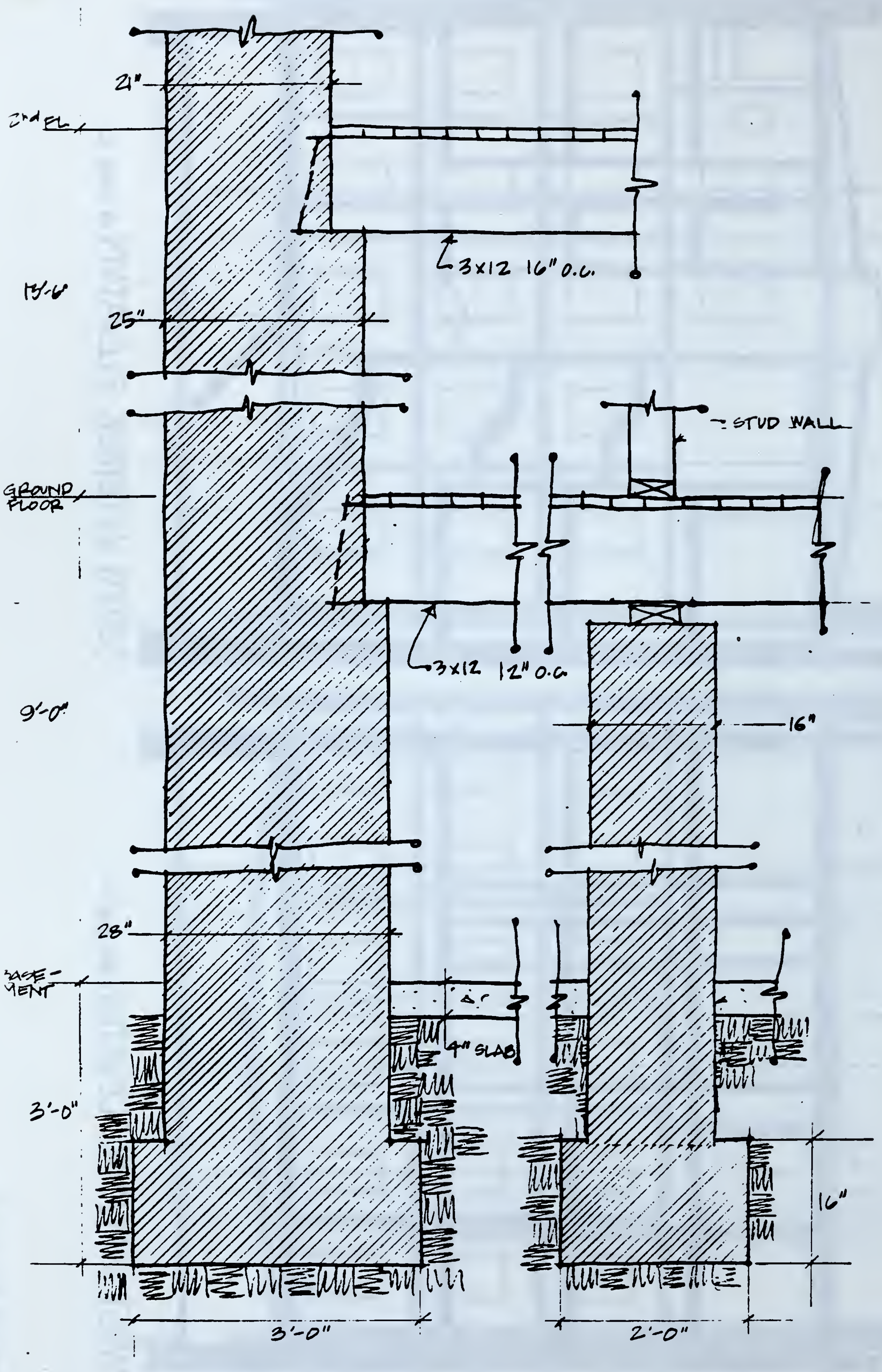


WEST INTERIOR ELEVATION @ LINE A



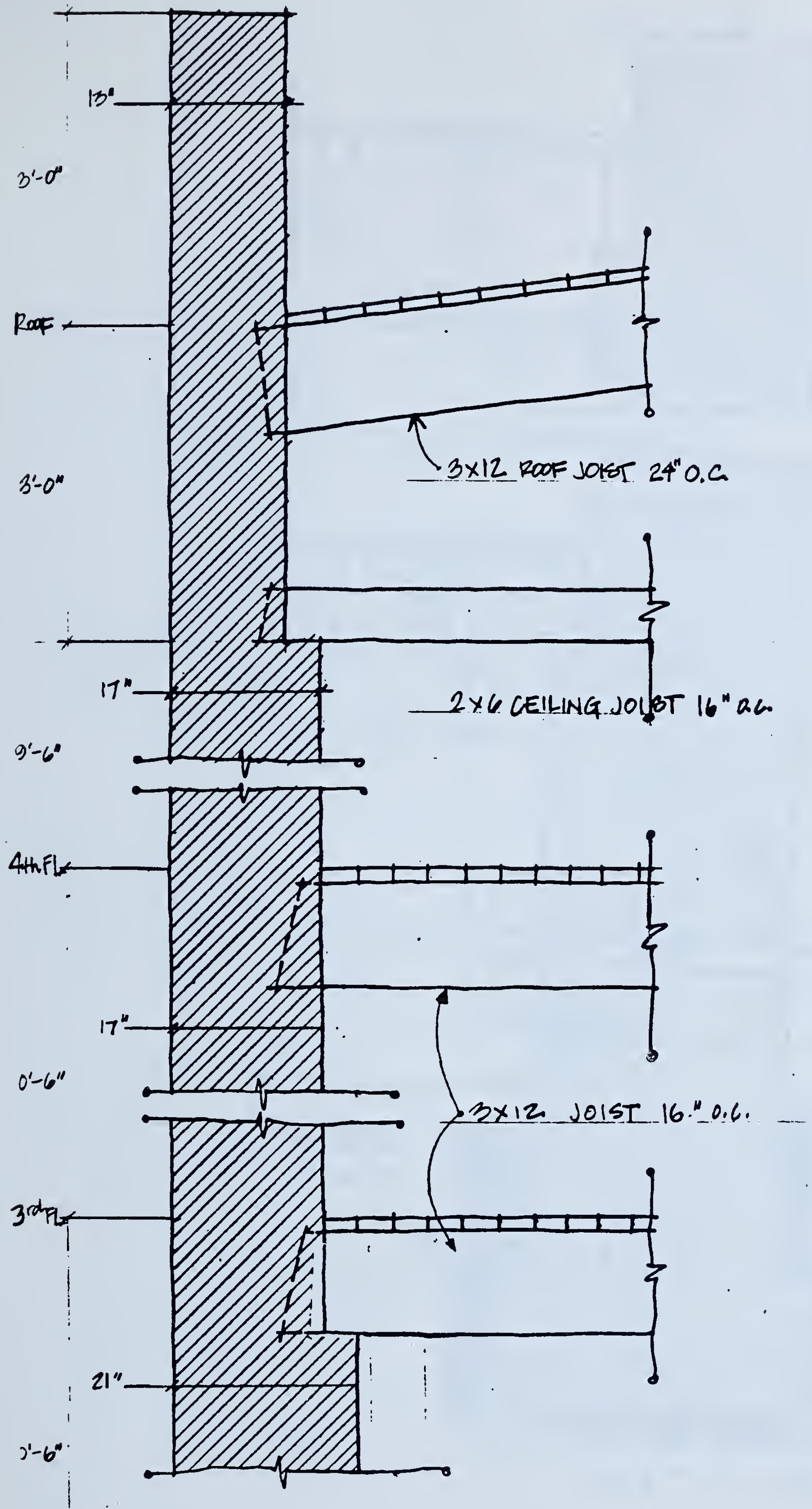
SOUTH INTERIOR ELEVATION @ LINE 1

BUILDING #4



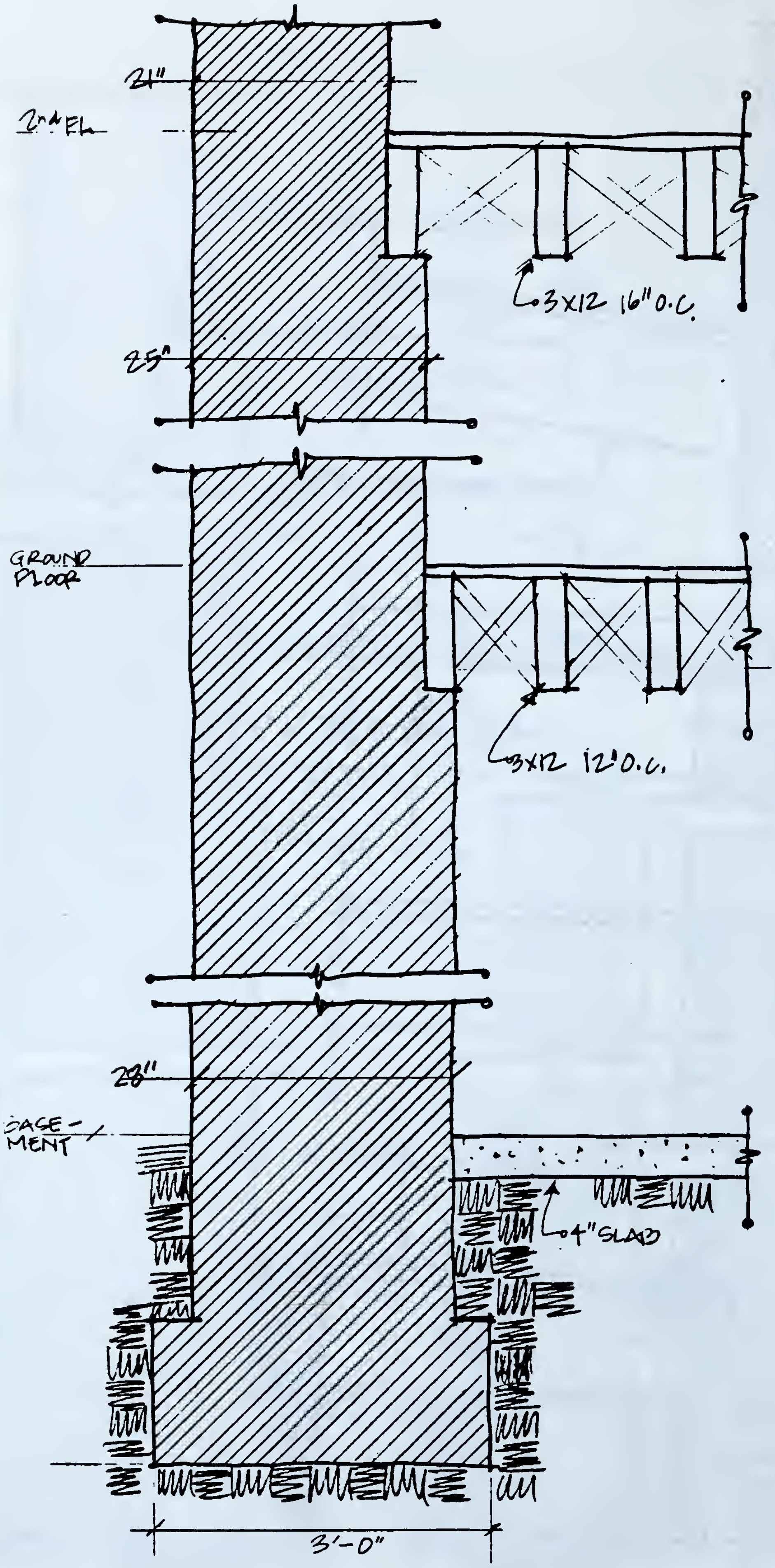
EAST-WEST
WALL SECTION

BUILDING #4



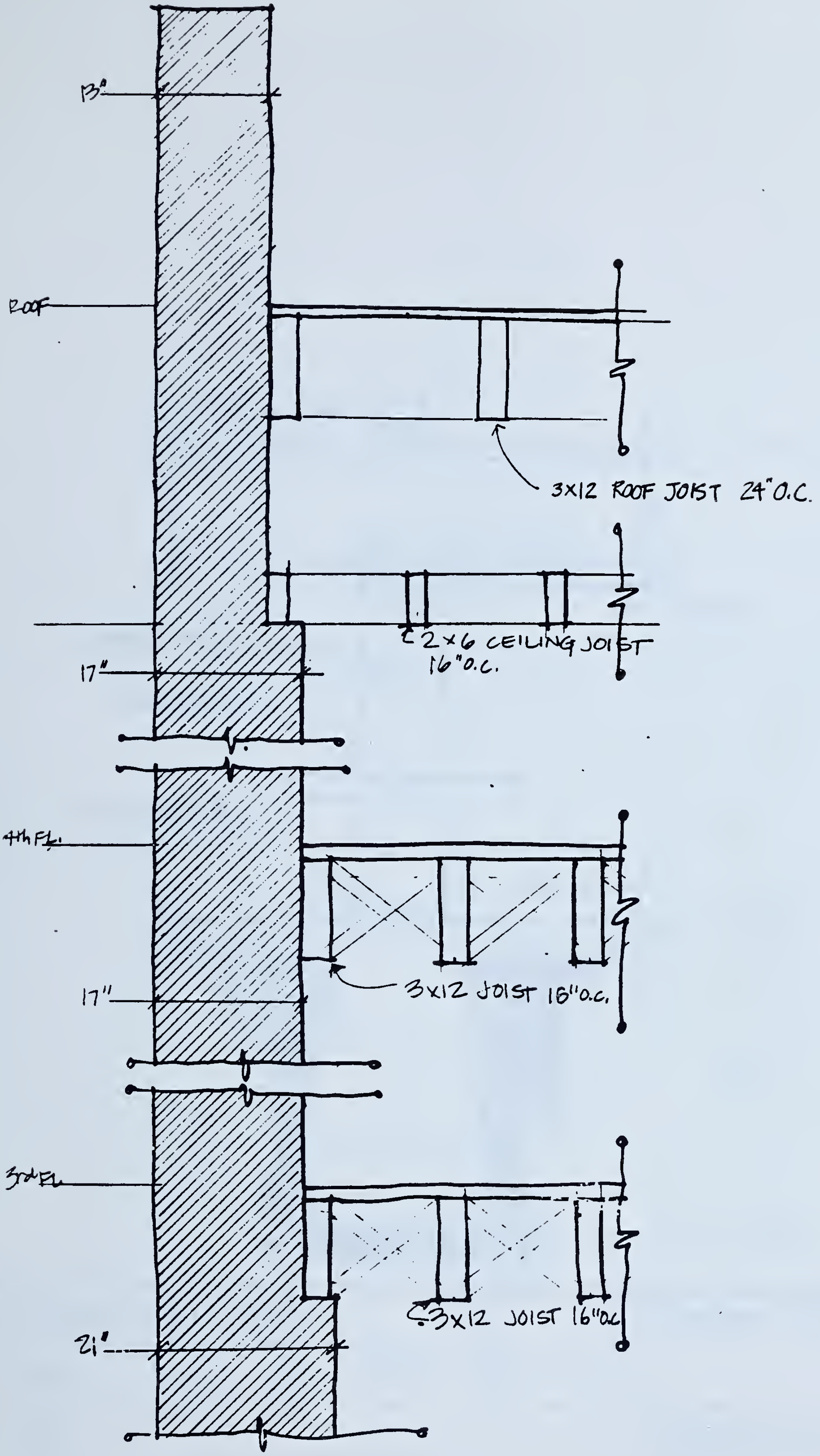
EAST-WEST
WALL SECTION

BUILDING #4



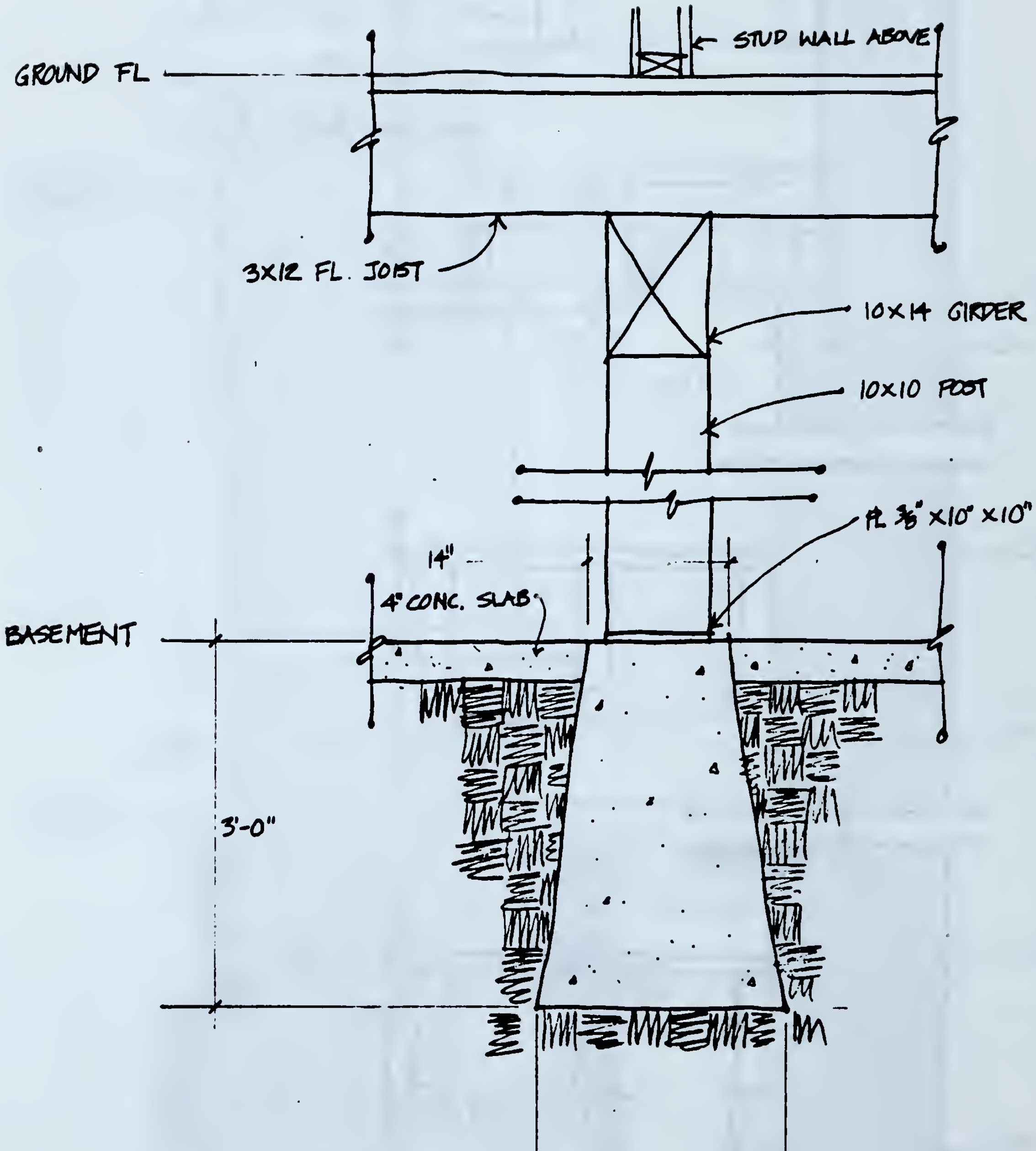
NORTH-SOUTH
WALL SECTION

BUILDING #4



NORTH-SOUTH
WALL SECTION

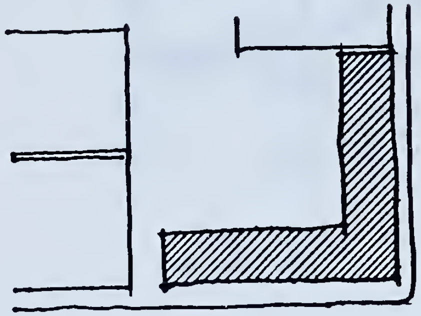
BUILDING #4


STUD WALL ABOVE
GROUND FL
3X12 FL. JOIST
10X14 GIRDER
10X10 POST
PL 3/8" X10" X10"
14"
4" CONC. SLAB
BASEMENT
3'-0"
2'-0"

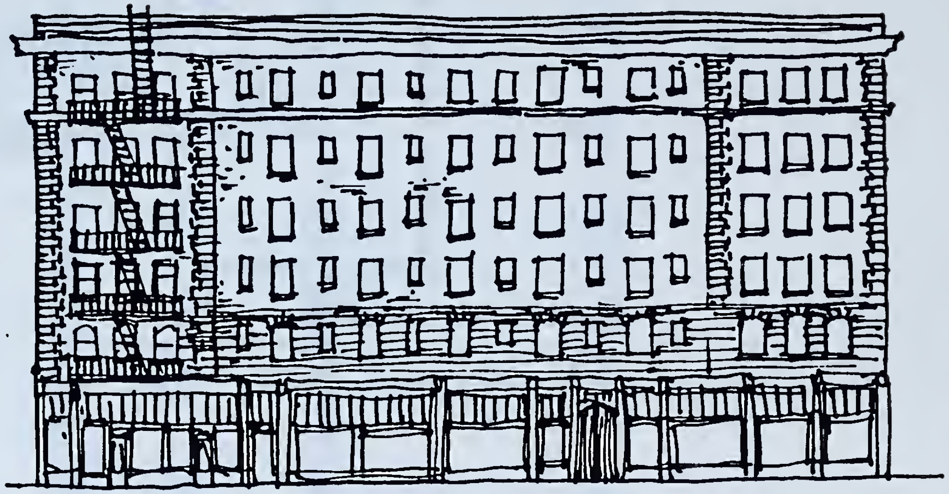
BUILDING #4

BUILDING #5

Number of Floors: 6	Period: $T = \frac{0.05h_n}{\sqrt{D}}$
Height: 73'-5"	
Width: 137'-6"	Transverse: 0.31 sec.
Length: 137'-6"	Longitudinal: 0.31 sec.

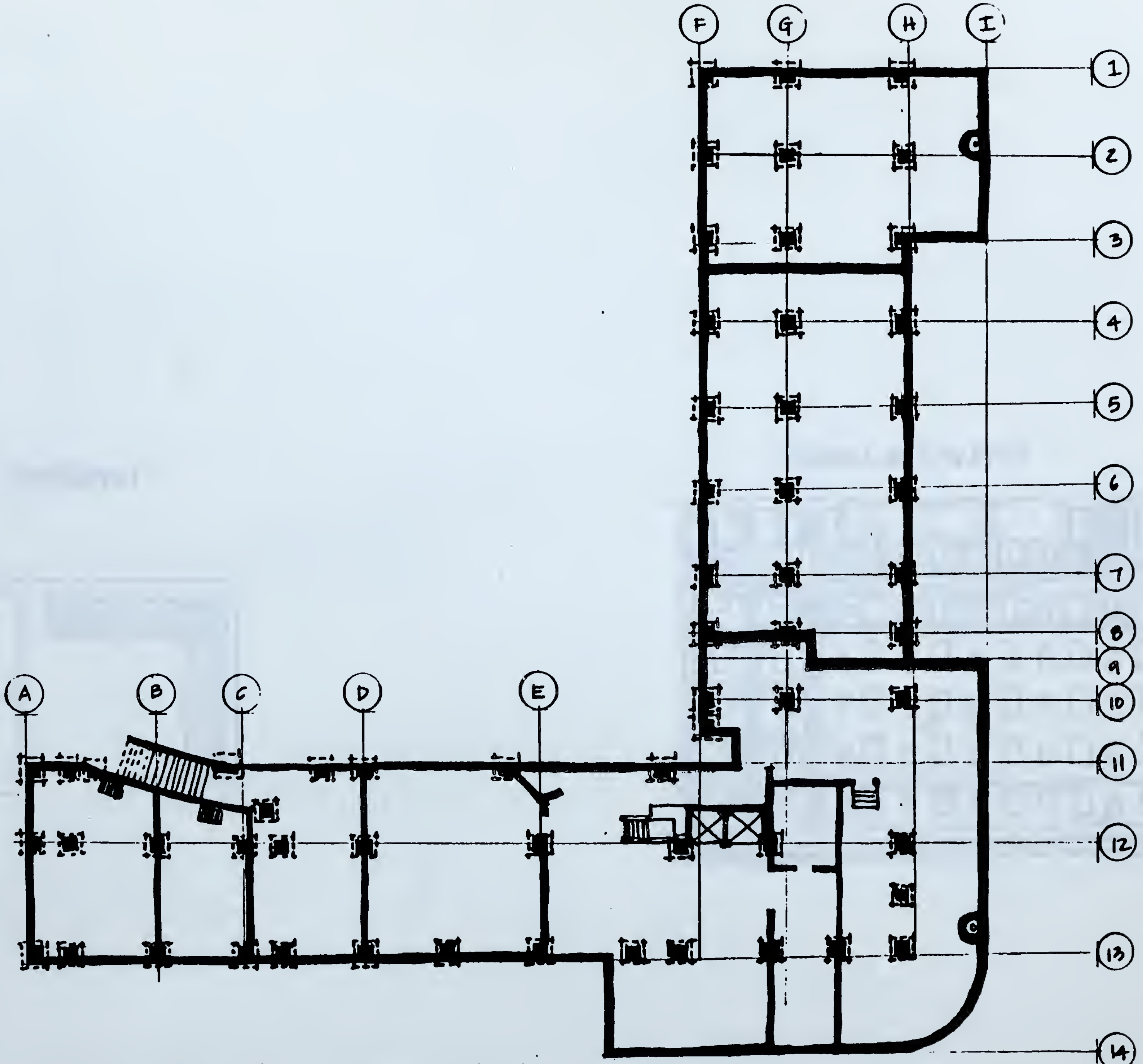


SITE DIAGRAM



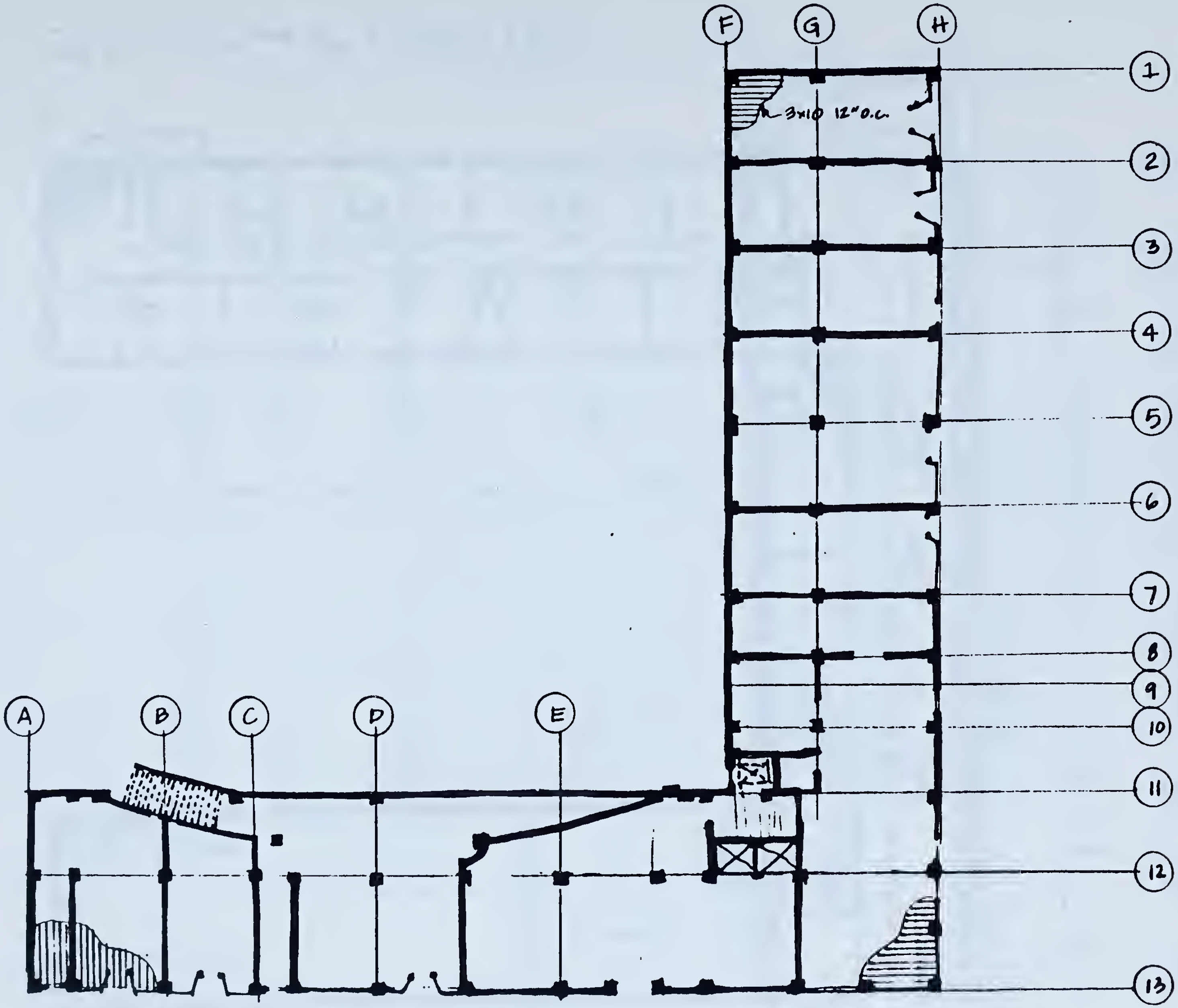
STREET ELEVATION

BUILDING #5



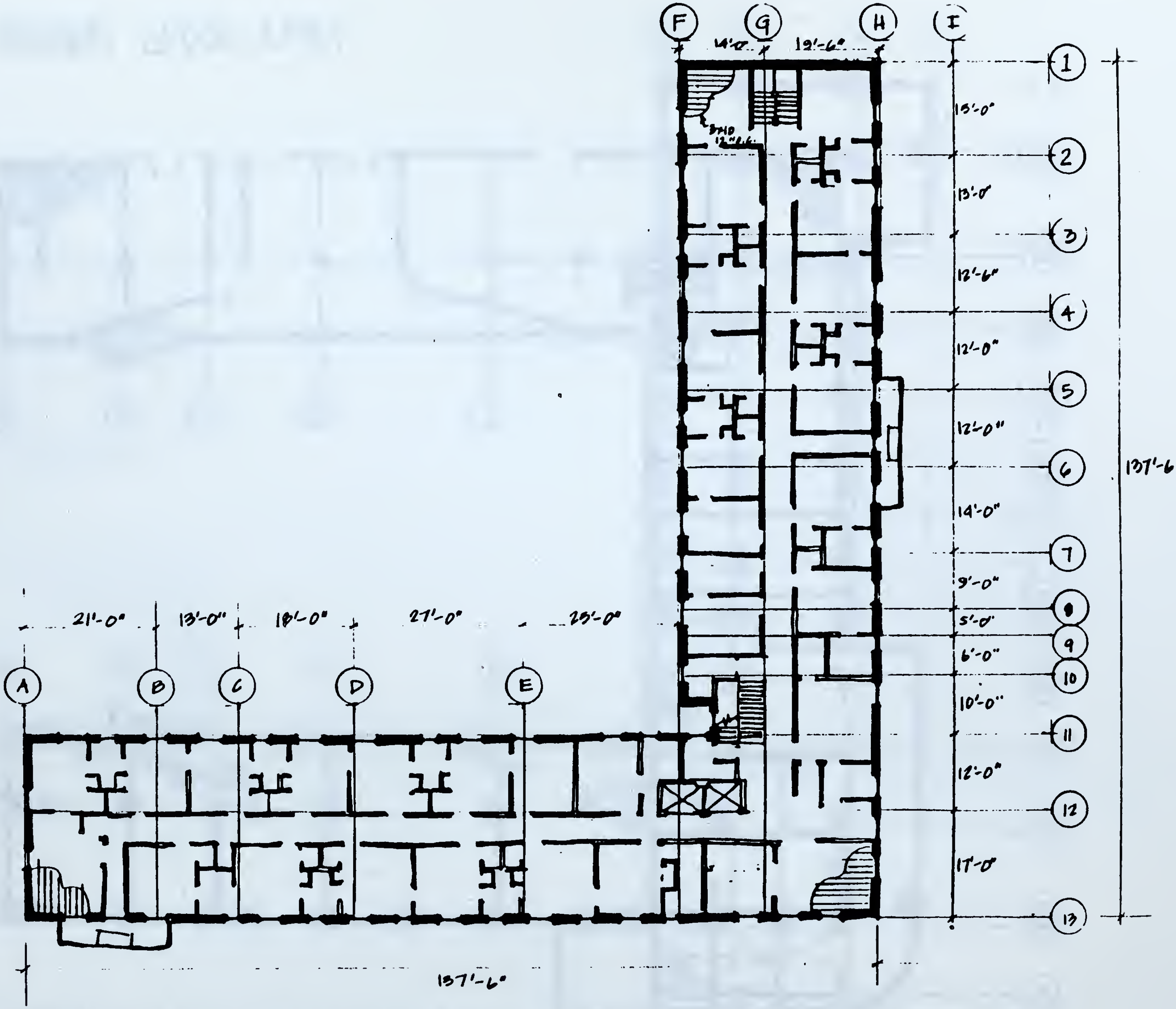
FOUNDATION/ BASEMENT PLAN

BUILDING #5



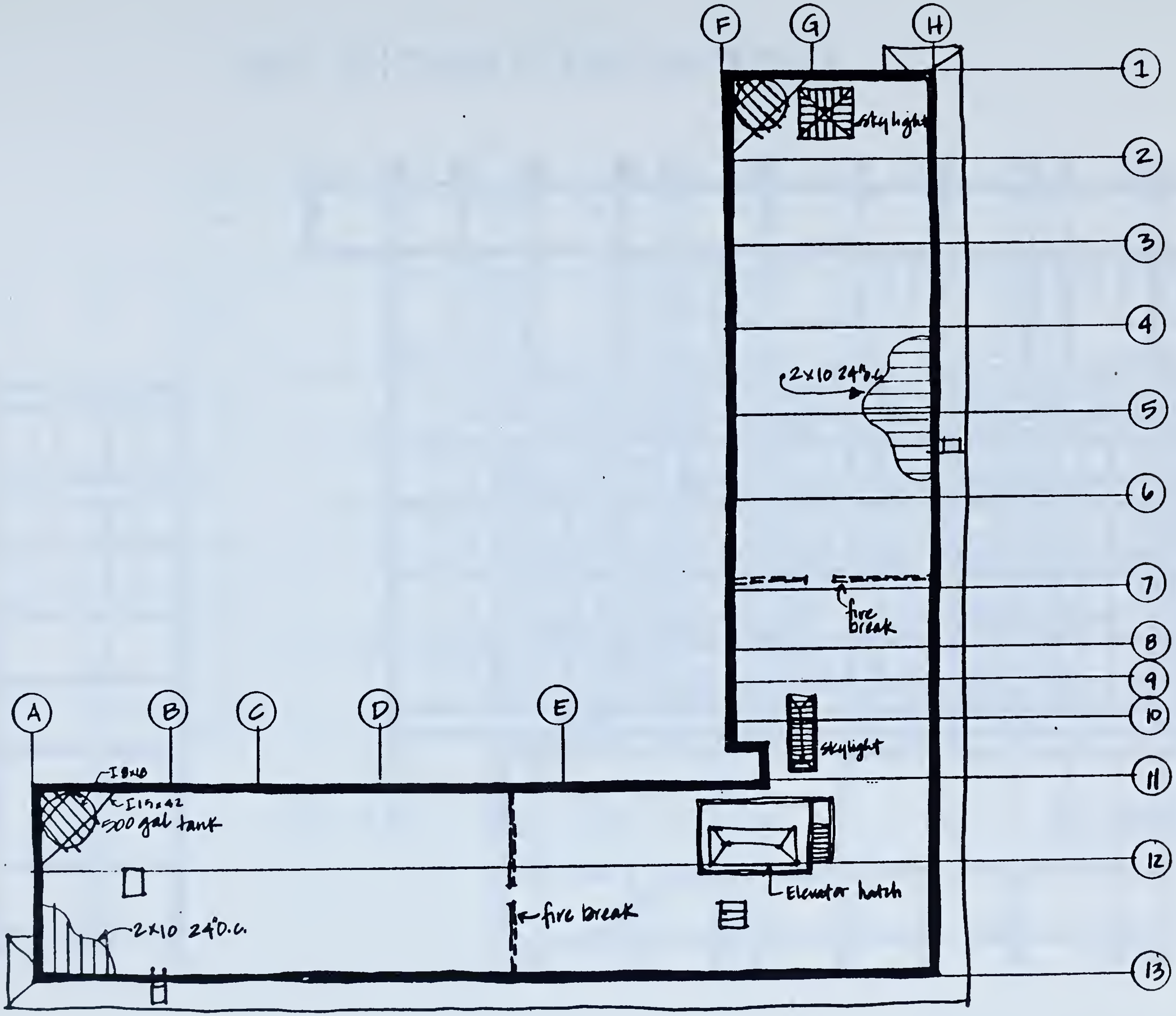
GROUND FLOOR PLAN

BUILDING #5



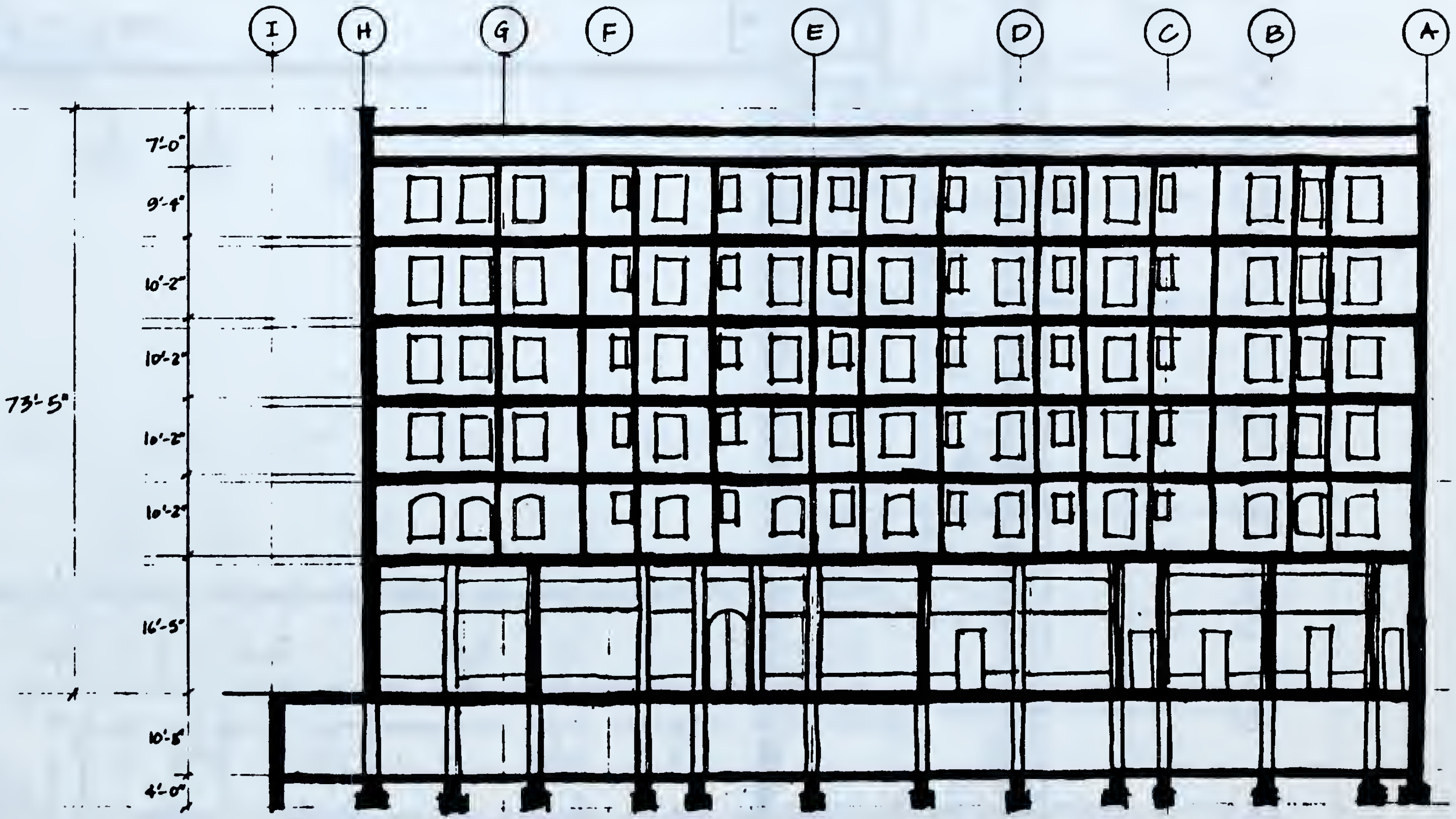
2nd, 3rd, 4th, 5th and 6th FLOOR PLAN

BUILDING #5



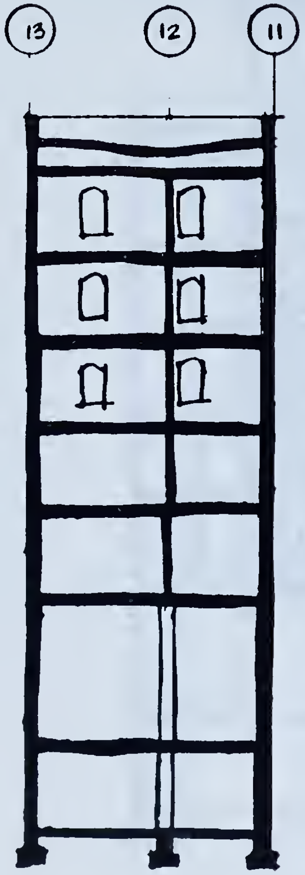
ROOF PLAN

BUILDING #5

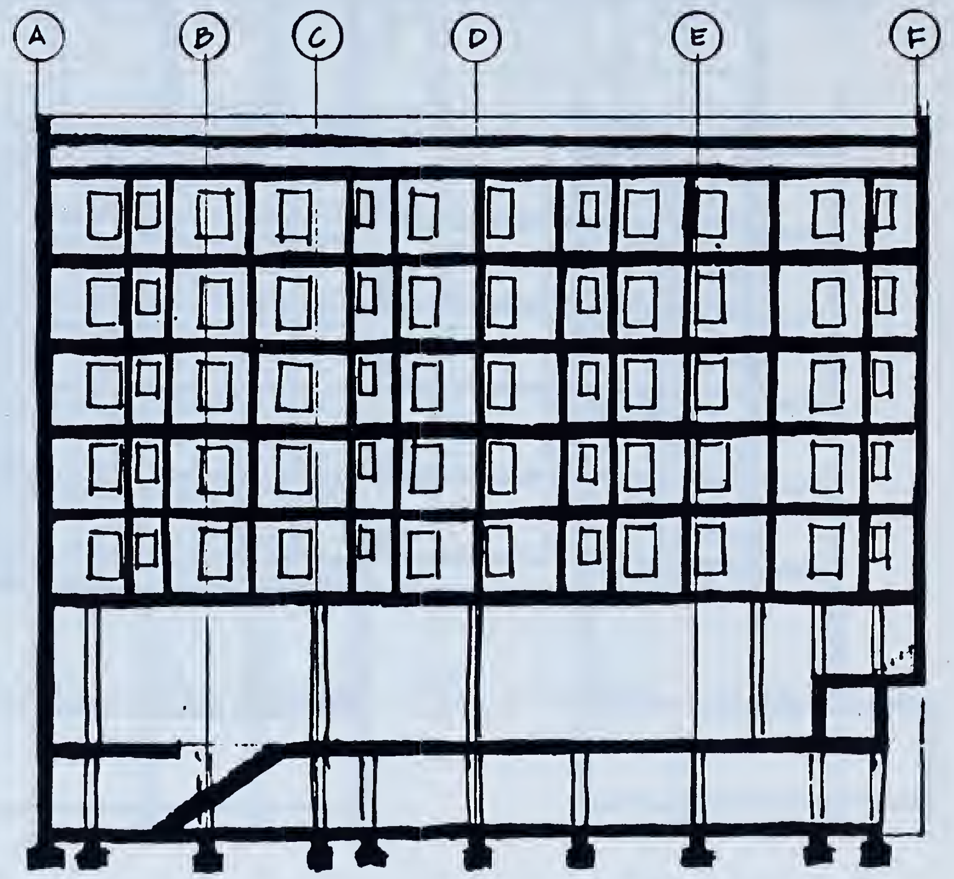


EAST INTERIOR ELEVATION @ LINE 13

BUILDING #5

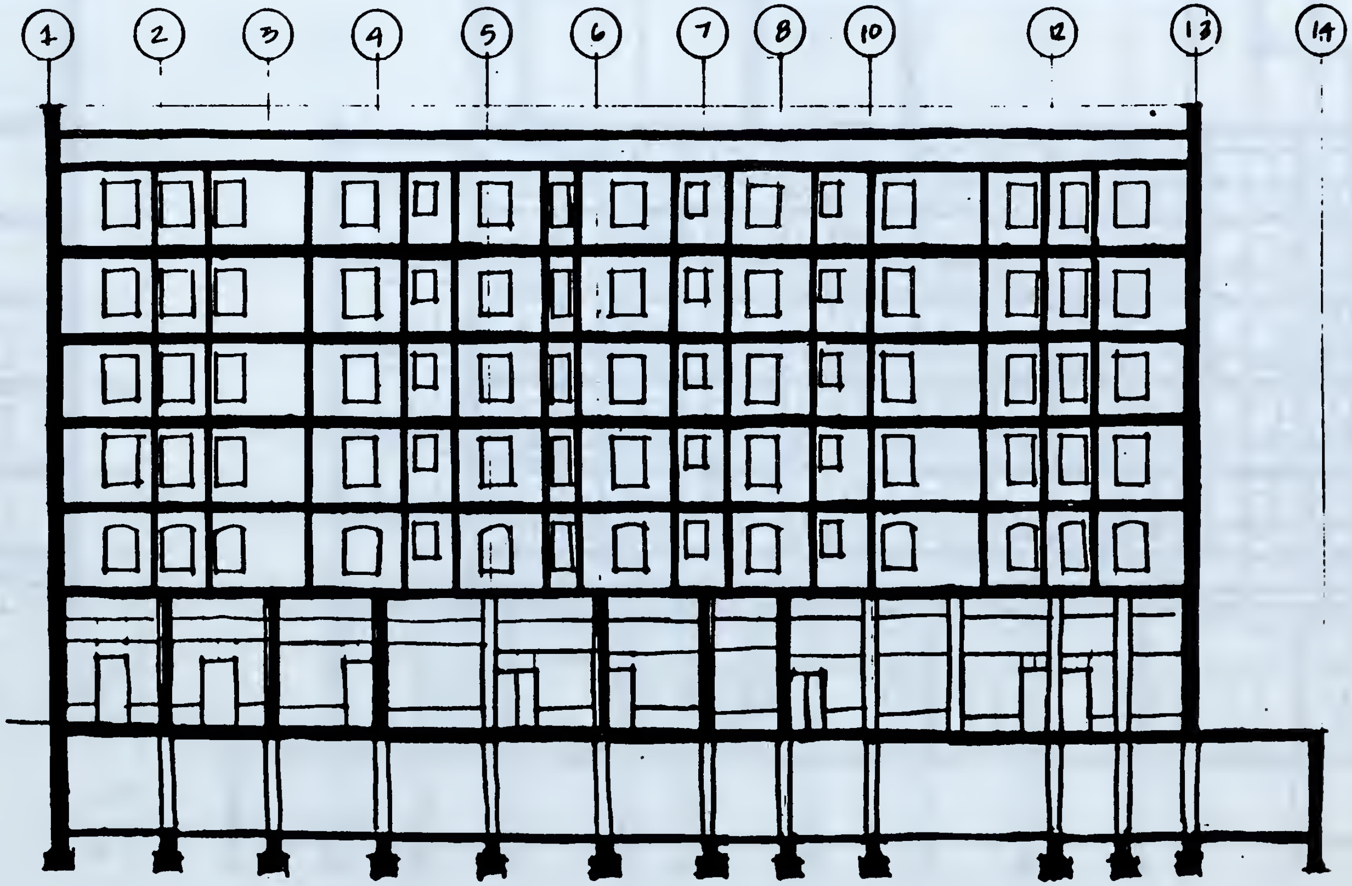


SOUTH INTERIOR
ELEVATION @ LINE A



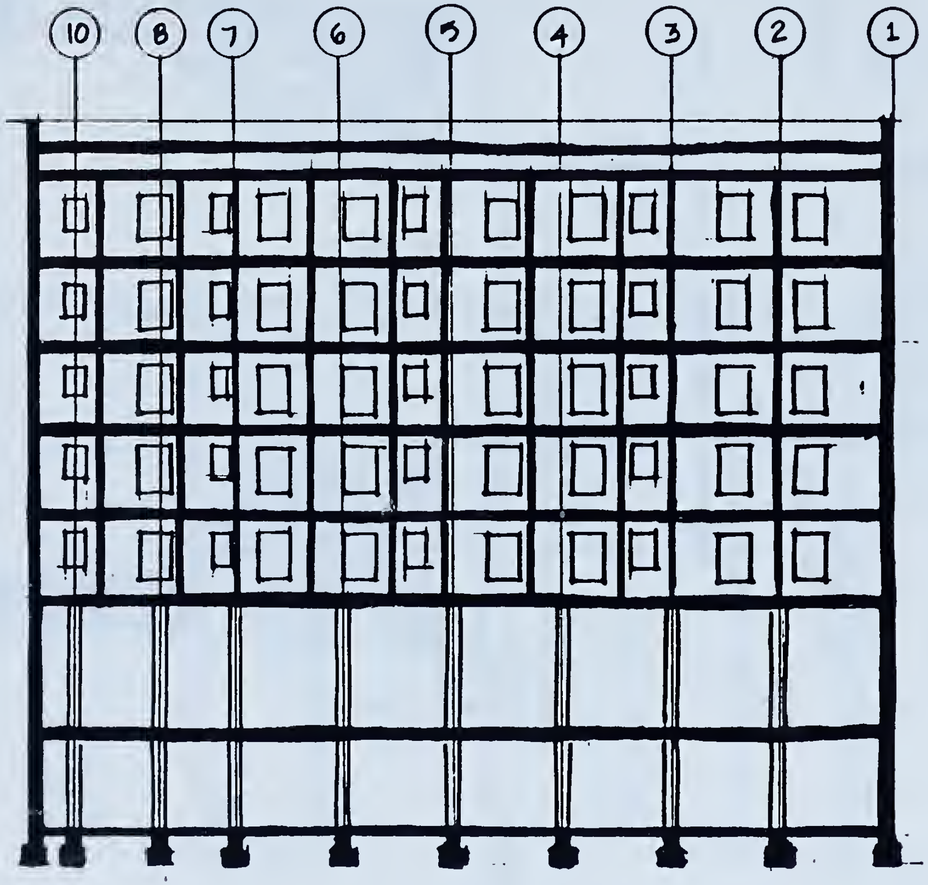
WEST INTERIOR ELEVATION @ LINE 11

BUILDING #5

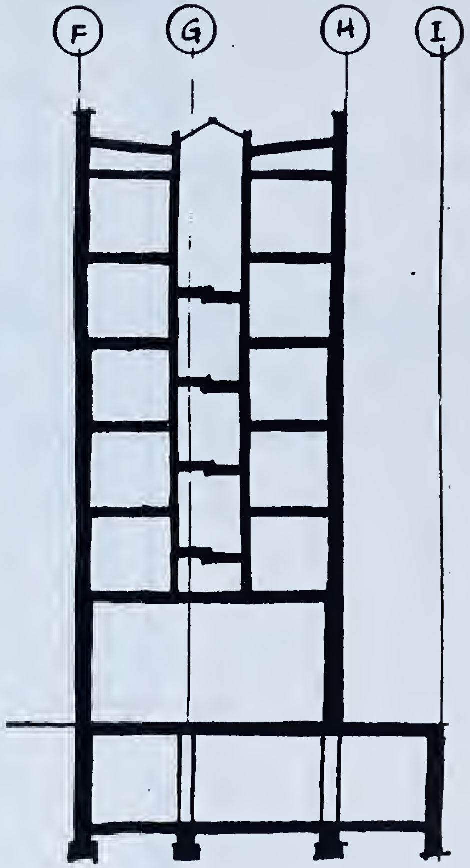


NORTH INTERIOR ELEVATION @ LINE H

BUILDING #5

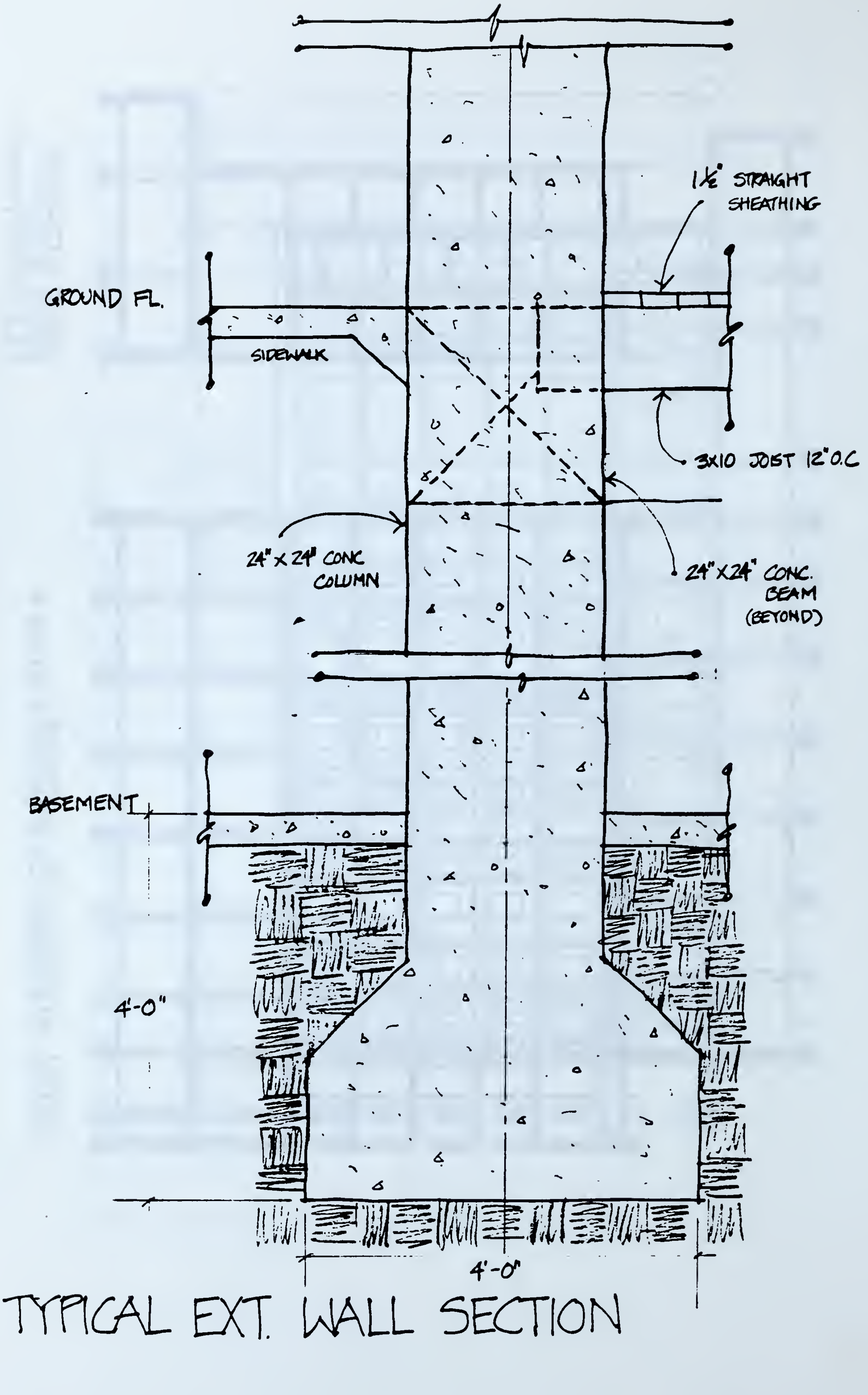


SOUTH INTERIOR ELEVATION @ LINE F



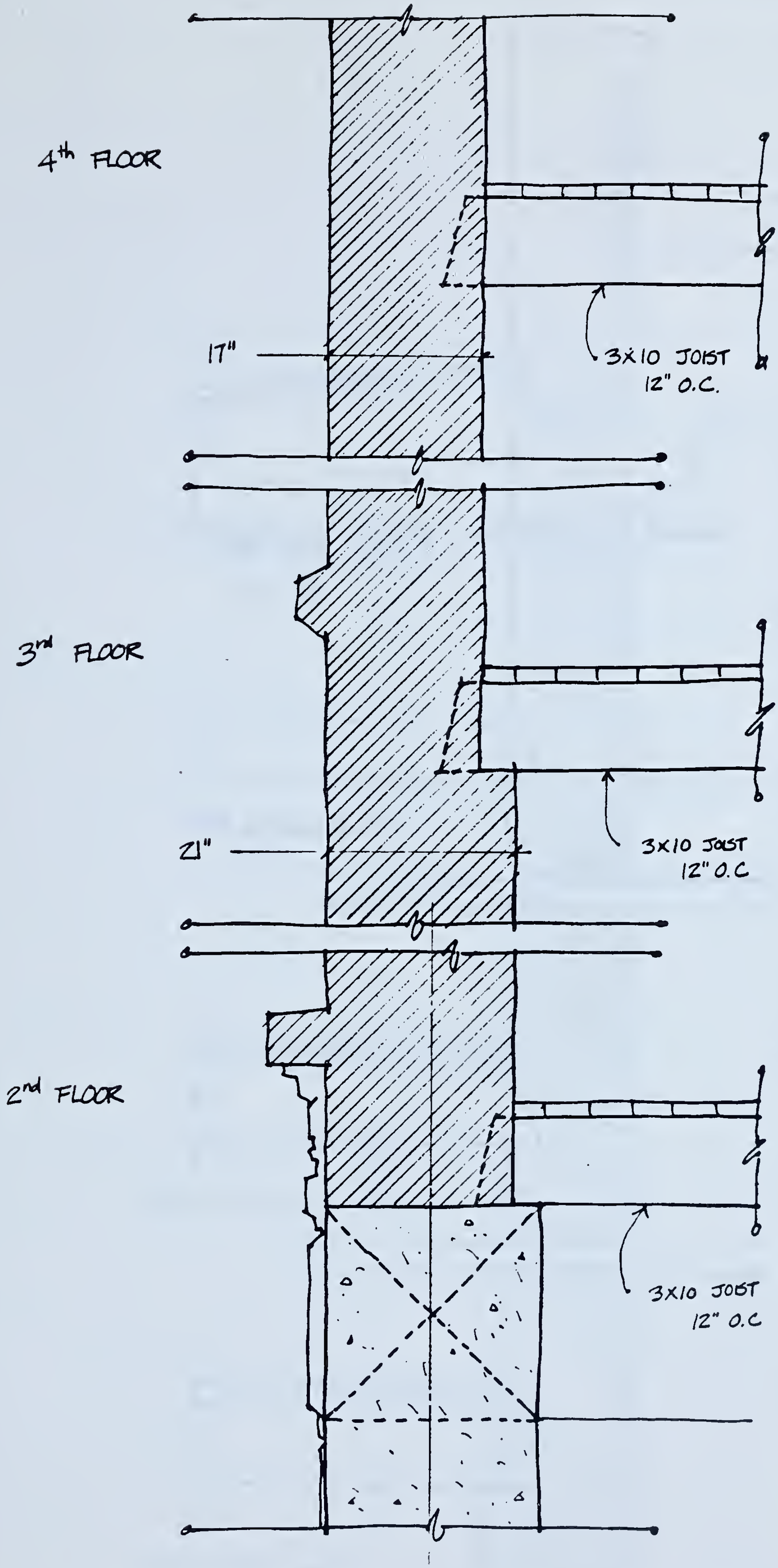
WEST INTERIOR ELEVATION @ LINE 1

BUILDING #5



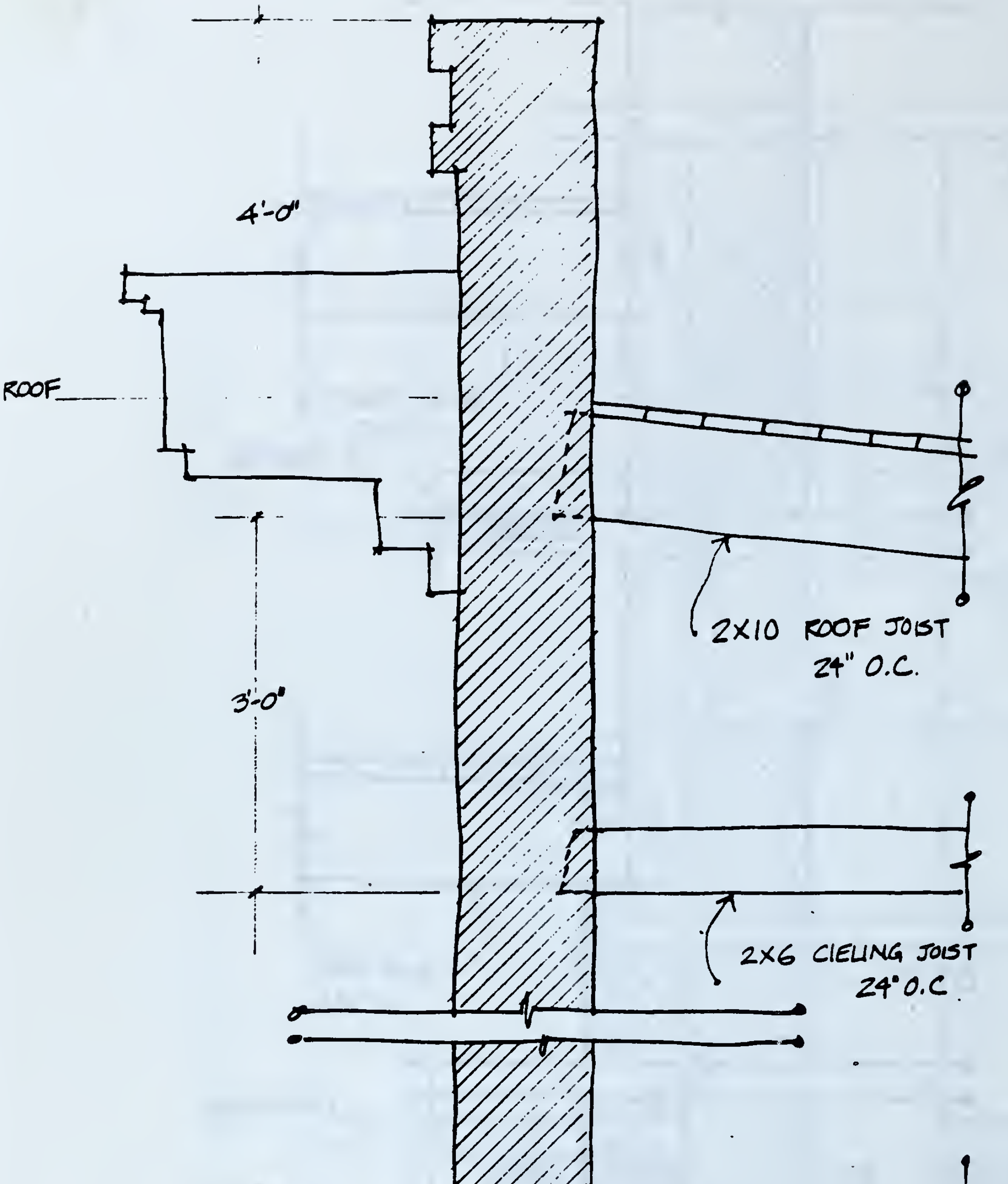
TYPICAL EXT. WALL SECTION

BUILDING #5



TYPICAL EXT. WALL SECTION

BUILDING #5

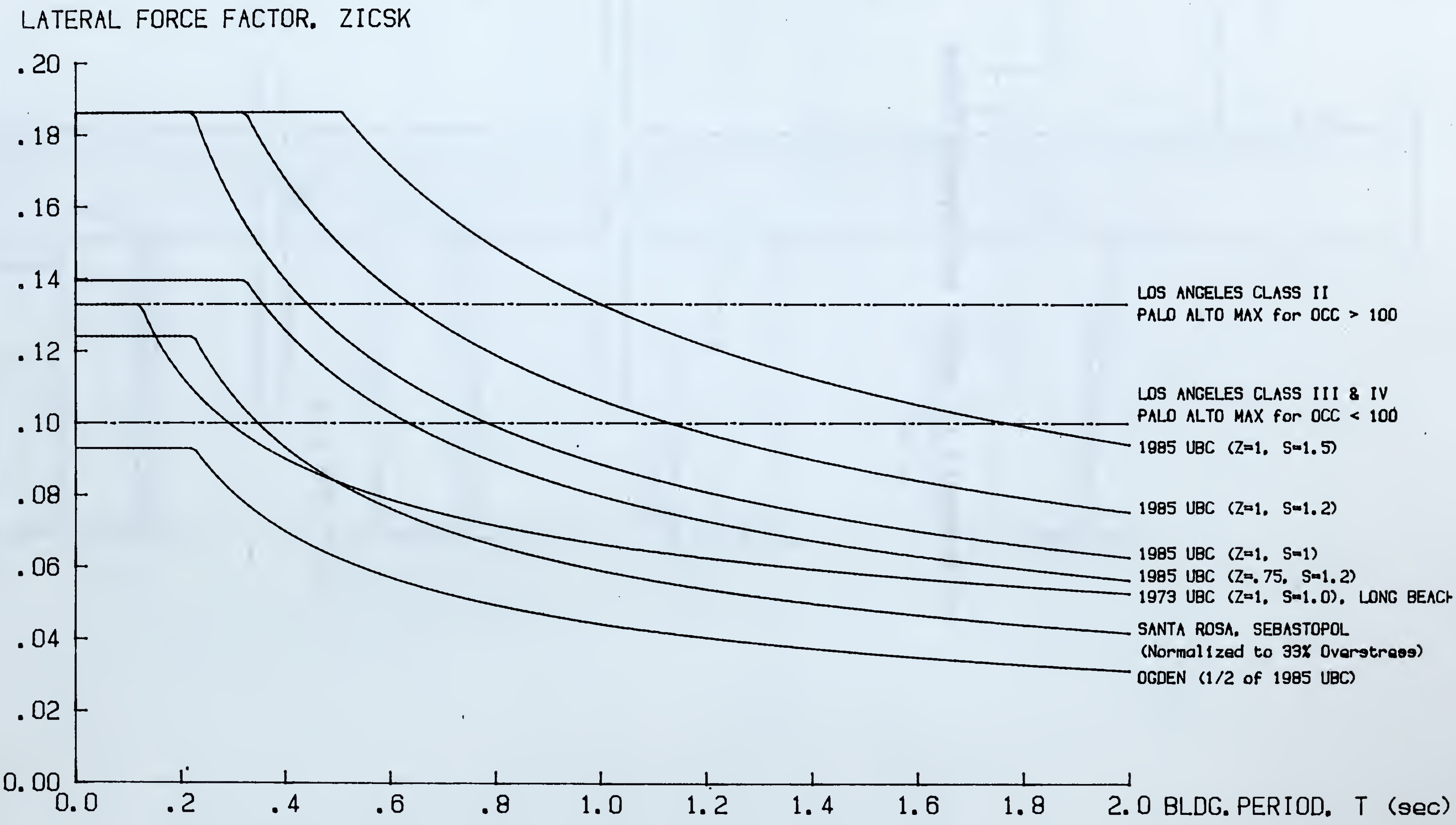


TYPICAL EXTERIOR WALL SECTION

BUILDING #5

c: synopsis of major earthquake codes

COMPARISON OF CODE REQUIREMENTS



UNIFORM BUILDING CODE

While the UBC does not have a seismic code specific to existing buildings, its lateral force requirements for new buildings can be considered the level of "total upgrading." The 1985 UBC requirements follow.

STRENGTH REQUIREMENT SYNOPSIS

1. Overall Shear Requirement

    a. Base Shear

    V=ZICSKW, where K=1.33 for box systems;
    I=1.0 for Zone 4;
    Z=0.75 for Zone 3 and 1.0 for Zone 4; and
    CSmax=0.14.

    Thus, the maximum base shear are: V(zone 4)=0.186W and V(zone3)=0.14W.

    b. Allowable Overstress

    Overstresses of 33% are allowed when considering the combination of dead load plus earthquake load,

    f(EQ+DL)=1.33F, where f(EQ+DL)=stress in material due to combined vertical and earthquake loads.

    F=allowable stress for material.

2. Component Shear Requirement

    a. Diaphragms

    The shear requirement for diaphragms is given by the equation,

    Fpx(max)=0.30ZIWpx, where Wpx=weight of diaphragm at level x plus tributary weight.

    b. Walls and Parapets

    The shear requirement for these components is given by the equation,

    Fp=ZICpWp, where Wp=weight of specified portion of structure and Cp is given as follows:

component	direction of force	Cp
wall	normal to surface	0.30
parapet	normal to surface	0.80

c. Allowable Overstress

Overstresses of 33% are allowed when considering the combination of dead load plus earthquake load.

3. Design Allowable Stresses for Existing Materials.

None.

LOS ANGELES

In 1981 the City of Los Angeles amended Article I of Chapter IX of the Los Angeles Municipal Code to add a Division 88: Earthquake Hazard Reduction in Existing Buildings.

SCOPE: This ordinance applies to all URM buildings built prior to 10-6-33. (There are approximately 8000 such buildings in the city of Los Angeles.)

CLASSIFICATION: All buildings included in the above group will be placed in one of the following categories:

I. Essential: Any building housing a hospital or other medical facility having emergency treatment areas; fire or police stations; municipal government disaster operation and communication centers.

II. High Risk: Any building, not classified as Essential, having an occupant load of 100 or more.

III. Medium Risk: Any building not classified as High Risk or Essential having an occupant load of 20 or more.

IV. Low Risk: Any building not classified as High Risk or Essential, having an occupant load of less than 20.

TIME FRAME

Alternative 1: Total Compliance.

Time	Action
0	Service of Order
270 days	Structural Analysis and Plans for Alternatives
1 year	Building Permit Obtained
1-1/2 yrs.	Commence Construction
3 years	Complete Construction

Alternative 2: Anchors First.

Time	Action
0	Service of Order
120 days	Plans Submitted for Wall Anchor Installation
180 days	Building Permit Obtained
270 days	Commence Construction
1 year	Complete Construction of Anchor Installation
4 years	All work done on Class I buildings
6 years	All work done on Class II buildings
8 years	All work done on Class III buildings with occupant load greater than 19
10 years	All work done on Class IV buildings

Alternative 3: Demolition (with the option of building a new building with reduced zoning requirements).

Time	Action
0	Service of Order
270 days	Plans for Demolition Submitted

STRENGTH REQUIREMENTS

1. OVERALL SHEAR REQUIREMENT

   a. Base Shear

   The formula used to compute base shear is

   $V=ZICSKW$

   Maximum base shears are:

   $V=.186W$ for Class I bldgs.
   $V=.133W$ for Class II bldgs.
   $V=.100W$ for Class III and IV bldgs.

   b. Allowable Overstress

   When earthquake loads are included with dead loads, the building can be overstressed by 33%, or

   $f(DL+EQ)=1.33F$, where $f(DL+EQ)$=stress in the material due to dead load plus earthquake load, F=allowable stress for that material. When live loads are added, $f(DL+EQ+LL)=2.0F$.

2. COMPONENT SHEAR REQUIREMENT

   a. Diaphragms, Walls, Parapets

   The required shear force to be resisted by each element is determined by formula:

   $Fp=ICpSWp$, where $IS_{max}=1.00$ and Wp=weight of component and Cp is given below:

component	direction	Cp
walls	normal to surf.	.2
parapets	normal to surf.	1.0
diaphragms	in-plane	0.12

   When diaphragms are tied to walls, the minimum anchorage required is 200 plf.

b. Allowable Overstress

Same as 1985 UBC.

c. Maximum Height to Thickness Ratio

	h/t	h/t with cross wall
Walls in one story bldg.	13	16
Walls in 1st story of multi-story bldg.	15	16
Walls in top story of multi-story bldg.	9	14
All other walls	13	16

3. DESIGN ALLOWABLE STRESS FOR EXISTING MATERIALS

a. Horizontal Diaphragms:

Roofs w/straight sheathing	100plf*
Roofs w/diagonal sheathing	400plf
Floors w/straight T&G sheathing	150plf*
Floors w/straight sheathing & finished flooring	300plf
Floors w/diagonal sheathing & finished flooring	450plf

*plus 50 plf for plaster applied to joist.

b. Others:

Wood stud wall with lath and plaster	100 plf each side
Plain concrete footing	fi=1500 psi
Reinforcing steel	ft=18,000 psi
Structural steel	ft=20,000 psi

AVAILABLE GOV'T FINANCING: Community Development Department, Community Redevelopment Agency, and City Economic Development Office. The Mayor's task force is currently studying ways of providing low-interest financing through Assembly Bill 604, which would provide funds for the strengthening of residential buildings.

SANTA ANA

Article XI of the Santa Ana Municipal Code: Earthquake Hazard Reduction in Existing Buildings.

SCOPE: All existing buildings with URM walls, except detached dwellings or apartment buildings with less than 5 dwelling units.

CLASSIFICATION:
I. Essential: used for emergency purposes.
II. High Risk: occupant load > 100, unless used less than 20 hours per week OR is braced with cross walls spaced less than 40' apart.
III. Medium Risk: occupant load > 20.
IV. Low Risk: occupant load < 20.

TIME FRAME:

Time	Action
0	Class I Bldg. owners notified
6 mo.	Class II Bldg. owners notified
18 mo.	Class III Bldg. owners notified
5 years	Class IV Bldg. owners notified

Alternative 1: Full Compliance

Time	Action
0	Order (at time specified above)
270 days	Plans submitted
1 year	Permits obtained
3 years	Building Corrected

Alternative 2: Anchors First (an option for Classes III and IV).

Time	Action
0	Order (at time specified above)
180 days	Anchor permits obtained
270 days	Work begins
1 year	Anchors done
3 years	Class III buildings totally upgraded
5 years	Class IV buildings totally upgraded

STRENGTH REQUIREMENTS: Same as Los Angeles.

LONG BEACH

Long Beach Municipal Code, Subdivision 80: Earthquake Hazard Regulation for Rehabilitation of Existing Structures within the City.

SCOPE: All type I, II and III buildings located within the City and built prior to 1-9-34 which do not meet the 1970 UBC Lateral Force Requirements.

CLASSIFICATION: Buildings built before 1-9-34 will be inspected and classified as follows:

I. Excessive Hazard
II. High Hazard
III. Intermediate Hazard

The classification is based on the seismic capacity of the walls, horizontal diaphragms, connections and shear and moment resisting elements, in addition to occupancy.

TIME FRAME: Classification	Notice of Required Work Given	Plans Submitted by Owner
I.	ASAP	120-240 days from notice
II.	1-1-84	same as above
III.	1-1-91	same as above

STRENGTH REQUIREMENTS

The 1970 UBC is the standard, with the inclusion of allowable stresses for existing materials.
For an URM building with occupancy between 100 and 300 the following requirements apply.

1. OVERALL SHEAR REQUIREMENTS

a. Base Shear

The following equation applies,

$V=ZKCW$, where $K=1.33$ for a box system,

$C=0.05/3\ T$ and $T=0.05hn/\ D$

b. Allowable Overstress
Overstresses are not stated explicitly, and thus it could be assumed that they are 33%, as in the 1970 UBC.

2. COMPONENT SHEAR REQUIREMENTS

a. Diaphragms, Walls and Parapets

The shear requirements for these components are given by the equation,

$Fp=ZCpWp$, where $Z=1$ for Zone 4

Wp=weight of component
Cp=0.10 for diaphragms
0.20 for walls
1.00 for parapets.

b. Allowable Overstress

33% overstresses are allowable.

c. Height to Thickness Ratio Requirement

	h/t (walls)
Poor lime mortar	5
Fair lime mortar	10
Cement mortar	15

3. DESIGN ALLOWABLE STRESSES FOR EXISTING MATERIALS

a. Horizontal Diaphragm

All diaphragms with straight sheathing	50 plf
All diaphragms with diagonal sheathing	300 plf

b. Allowable Shear in Mortar

Lime mortar (poor quality)	2 psi
Lime mortar (fair quality)	4 psi
Cement mortar	7.5 psi

c. Anchor Bolts

Anchorage and bolt values in lime mortar masonry is considered 50% of the values established for solid URM in the 1970 UBC.

TIME FRAME:

Time	Action
1-1/2 yrs.	Class I buildings submit engineering report
2 yrs.	Class II
2-1/2 yrs.	Class III
3 yrs.	Class IV
4 yrs.	Class V
5 yrs.	Class VI

One year after report submitted, Letter of Intent is due. (See description below.)

REQUIREMENTS:

1. Notification of Building Tenants. Owner must notify tenants that a structural investigation has been performed and that the report is available at the Building Inspection Division.
2. Letter of Intent. Building owner must submit letter to the Building Inspection Division within one year of the date of the engineering report indicating the owner's intentions for dealing with potential hazards in the buildings. The Letter of Intent includes a project time line for corrective action.

In addition, the ordinance calls for mandatory seismic upgrading to current code standards when remodeling, alterations, or repairs in excess of 50% of the replacement cost of the buildings are made.)

SANTA ROSA

Santa Rosa City Code, Uniform Code for the Abatement of Dangerous Buildings. Existing Buildings: Review and Abatement.

SCOPE:
- a. All buildings constructed before 12-31-57 except public schools and 1-2 family wood frame dwellings;
- b. All buildings with unreinforced masonry walls, which do not meet the 1955 UBC lateral force requirements.

TIME FRAME:
1. Preliminary review of buildings noted above.
2. City notifies property owner to correct deficiencies.
3. Owner has an engineer prepare a review of the building.
4. Owner begins reinforcement work.

(no specific deadlines are given)

STRENGTH REQUIREMENT SYNOPSIS

The requirements for reinforcement work are specific to individual parts of the building. Thus there is no direct comparison between strength of this code and current UBC. If a building in the scope of this ordinance is determined not to meet the 1955 UBC seismic standards, then the following requirements apply.

1. OVERALL SHEAR REQUIREMENTS

For the building as a whole, shear force requirements are the same as current UBC (i.e., as the UBC changes, so do Santa Rosa's requirements). Thus, the equation used is

$$V=ZICSKW.$$

However, while the 1985 UBC allows overstresses of 33%, or $f(EQ+DL)=1.33F$, Santa Rosa allows 100% overstresses, or $f(EQ+DL)=2F$. For purposes of comparison, we can normalize force requirements to an allowable overstress at 33% from that of overstress allowed by the Santa Rosa ordinance.

2. COMPONENT SHEAR REQUIREMENTS

a. Diaphragms

The equation used is

$Fpx=0.30Wpx$.

However, 100% overstresses are allowed. Normalizing this equation to the current UBC allowable 33% overstresses,

$Fpx=0.20Wpx$.

b. Walls, Parapets

For walls,

$Fp=0.20Wp$, with 50% allowable overstresses.

Normalizing this to 33% overstresses,

$Fp=0.177Wp$.

For parapets,

$Fp=0.05Wp$. Normalizing this to a 33% overstress,

$Fp=0.443Wp$.

SEBASTOPOL

Council Policy 11-A, Existing Buildings: Review and Abatement.

SCOPE: a. All buildings within Fire Zone No. 1 built before 1-1-60 except 1 & 2 family wood frame dwellings.

b. All buildings within Fire Zone No. 1 using URM walls.

c. All wood buildings in Fire Zone No. 1 now being used for commercial or mixed use.

d. Any building within the City which is being proposed for a change in occupancy in which the new occupancy exceeds 10.

e. Change in occupancy or use that is considered an added risk.

Any building in one of the above categories that does not comply with the 1958 UBC lateral force requirements falls under the scope of this policy.

TIME FRAME:

Time	Action
0	Building Inspector gives Order to Owner for structural analysis and necessary plans to be submitted
2 years	Plans Submitted
4 years	Permits Obtained
4-1/2 yrs	Necessary Alterations Commence
5 years	Building Corrected

STRENGTH REQUIREMENTS: Same as Santa Rosa, except that they come into effect when buildings do not meet 1958 UBC requirements (as opposed to 1955).

PALO ALTO

Chapter 16.42 to Palo Alto Municipal Code. Seismic Hazards Identification Program.

SCOPE

1. Buildings constructed of URM, except those of less than 1900 ft^2 containing six or fewer occupants.

II. Buildings constructed prior to January 1, 1935 containing 100+ occupants.

III. Buildings constructed prior to August 1, 1976 containing 300+ occupants.

Except:

a. Buildings which have been upgraded to LA Division 88 Standards for URM or later UBC.

b. Buildings whose uses are subjected to amortization under this code; provided that, upon termination of this use, such a building shall be required to be rehabilitated to the then current lateral force requirements in the UBC prior to occupancy by a conforming use.

CLASSIFICATION

I. All URM buildings.

II. All pre-1935 buildings other than URM w/100+ occupants.

III. All buildings with 300+ occupants between 1/1/35 and 8/76.

REQUIREMENTS

Buildings in the above stated scope are required to submit an engineering report within given time period, stated below:

Category	Engineering Report Submitted Within Date of Mailed Notice
I.	1-1/2 years
II.	2
III.	2-1/2

STRENGTH REQUIREMENTS

Buildings which can be shown to meet the following requirements are considered non-hazardous.

1. Overall Shear Requirements

   a. Base Shear

   Its shear resisting capacity must comply with the equation,

   $V=ZIKCSW$, where $Z=I=1.0$
   $KCS=1.33$, or 1.00
   $V=0.133W$ for occupant load > 100
   $V=0.100W$ for occupant load < 100

   b. Allowable Overstress

   33% overstresses are allowed.

2. Component Shear Requirements

   a. Diaphragms, Walls, Parapets
   The shear requirements for these components are given by the equation,

   $F_p=IC_pSW_p$, where $IS_{max}=1.0$ and
   $C_p=0.1$ for diaphragms
   0.2 for walls
   1.0 for parapets

   b. 33% overstresses are allowable.

3. Design Allowable Stress for Existing Materials:

1. Horizontal Diaphragms	
a. Roofs with straight sheathing with the roof covering applied directly to the sheathing.	100 pounds per foot for seismic shear
b. Roofs with diagonal sheathing with the roof covering applied directly to the sheathing.	400 pounds per foot for seismic shear
c. Floors with straight tongue and groove sheathing.	150 pounds per foot for seismic shear.
d. Floors with straight sheathing and finished wood flooring.	300 pounds per foot for seismic shear.
e. Floors with diagonal sheathing and finished wood flooring.	450 pounds per foot for seismic shear.
f. Floors or roofs with straight sheathing and plaster applied to the values for items 1-a and 1-c joist or rafters.	Add 50 pounds per foot to the allowable
2. Shear Walls	
Wood stud walls with lath and plaster	100 pounds per foot each side for seismic shear
3. Plain Concrete Footings	f'c = 1500 psi unless otherwise shown by tests
4. Douglas Fir Wood	Allowable stress same as No. 1 D.F.2
5. Reinforcing Steel	f'c = 18,000 psi maximum[2]
6. Structural Steel	f'c = 20,000 psi maximum[2]

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[1] Material must be sound and in good condition.

[2] Stresses given may be increased for combinations of loads as specified in Subsection (b) of the analysis and evaluation portion of this appendix.

SEATTLE, WASHINGTON

Seattle's amendments to the 1982 UBC section on Existing Buildings include a section on seismic upgrading. The specific requirements are currently quite complicated. The Building Department is in the process of revising them. Simply stated, all buildings undergoing substantial additions or alterations shall comply with current UBC seismic regulations.

Exception: Buildings BUILT PRIOR TO 7/26/67: These buildings undergo an analysis based on the 1982 UBC, but with proper justification from an engineer, certain differences are acceptable. In other words, the use of the 1982 UBC is flexible, allowing the owner and engineer to present their arguments to the Building Official on a case by case basis. The current amendments also refer to exceptions made for buildings that are felt to be able to withstand seismic forces at least equal to those experienced during the 4/13/49 Seattle earthquake. This reference is not used as a design standard, but as a way to exempt buildings that survived the 1949 earthquake without structural damage.

OGDEN, UTAH

The City of Ogden enacted the SEISMIC HAZARD MITIGATION ORDINANCE in March of 1983.

SCOPE: All buildings constructed PRIOR to 6/19/75 WHICH ARE BEING REMODELLED, REPAIRED, ALTERED, OR CHANGED IN USE.

TRIGGER: 1. Structural alterations or repairs to structural elements; or 2. Alterations or repairs totaling over 50% of replacement cost of building.

STRENGTH REQUIREMENT: V=half of the current code requirements.

d: detailed cost breakdowns

COMPOSITE ESTIMATE

12/17/86

URM SEISMIC COST STUDY SUMMARY

for
University of California

ADJUSTED ESTIMATE

LEVEL	1		1		1		1	
BLDG.	1		1		2		2	
SCENARIO	1		2		5		6	
SF	15,634		15,634		15,405		15,405	
Category	$$/SF	$$	$$/SF	$$	$$/SF	$$	$$/SF	$$
0. Seismic Cut	.00	0	.00	0	.00	0	.00	0
1. Anchorage, Shear Bolts, etc.	3.05	47,644	3.05	47,644	5.50	84,762	5.50	84,762
2. Parapet Bracing	1.21	18,920	1.21	18,920	1.09	16,720	1.09	16,720
3. Out of Plane	.58	9,116	.58	9,116	.52	8,056	.52	8,056
4. Diaphragms	4.09	63,915	4.09	63,915	1.97	30,308	1.97	30,308
5. Transverse Shear Walls	2.58	40,381	3.08	48,150	5.80	89,285	6.34	97,713
6. Longitudinal Shear Walls	.00	0	.00	0	.00	0	.00	0
TOTALS (105% of structural + 100% of architectural costs)	11.93	$186,566	12.45	$194,645	15.44	$237,906	15.99	$246,250

1		1		2		2		2	
3		3		1		2		2	
11		12		3		7		8	
17,429		17,429		15,634		15,405		15,405	
$$/SF	$$	$$/SF	$$	$$/SF	$$	$$/SF	$$	$$/SF	$$
.00	0	.00	0	.00	0	.00	0	.00	0
5.67	98,889	5.67	98,889	3.05	47,644	5.50	84,762	5.50	84,762
.64	11,220	.64	11,220	1.21	18,920	1.09	16,720	1.09	16,720
.00	0	.00	0	.58	9,116	.52	8,056	.52	8,056
5.25	91,480	5.25	91,480	4.46	69,739	1.97	30,308	1.97	30,308
5.32	92,750	6.46	112,595	11.63	181,759	9.45	145,554	12.36	190,375
4.65	81,125	1.57	27,434	.00	0	1.06	16,376	.00	0
22.33	$389,109	20.28	$353,505	21.72	$339,557	20.34	$313,408	22.27	$343,039

2		2		2		2		3	
3		3		4		5		2	
13		14		15		16		10	
17,429		17,429		12,230		48,542		15,405	
$$/SF	$$	$$/SF	$$	$$/SF	$$	$$/SF	$$	$$/SF	$$
.00	0	.00	0	.00	0	1.56	75,530	.00	0
5.67	98,889	5.67	98,889	5.82	71,189	4.17	202,210	5.50	84,762
.64	11,220	.64	11,220	.00	0	.61	29,700	1.09	16,720
.00	0	.00	0	.00	0	.00	0	.00	0
5.25	91,480	5.25	91,480	7.53	92,058	2.74	133,014	4.96	76,458
6.41	111,647	10.15	176,983	5.84	71,412	7.27	353,088	12.40	191,026
5.41	94,318	2.63	45,875	5.95	72,810	6.62	321,273	12.86	198,185
24.24	$422,404	25.21	$439,452	26.04	$318,502	22.97	$1,114,814	38.16	$587,866

U R M Seismic Study

04-Dec-86

Building 1 LEVEL 1
Scenario 1
SF 15,634

Description	QTY.	Unit	Unit Price	Total
0. Seismic Separation Cut:				
Structural	0	LF	66.00	0
* Architectural	0	LF	50.00	0
Note: Added walls incl. in sections. 5 & 6				
Subtotal				$0
1. Anchorage, Shear Bolts, Chords & Collectors:				
Structural	688	LF	55.00	37,840
* Architectural, Demolition & Replace Finish	688	LF	14.25	9,804
Subtotal				47,644
2. Parapet Bracing:				
Structural	344	LF	55.00	18,920
3. Out Of Plane Bracing:				
Structural	344	LF	20.00	6,880
* Architectural - Demolition & Refinish	344	LF	6.50	2,236
Subtotal				9,116
4. Diaphragm:				
Structural, Plywood, Roofs	7,060	SF	2.10	14,826
Structural, Plywood, Floors	0	SF	2.60	0
Structural, 2" x 16 GA straps	220	LF	2.50	550
Structural, Steel Truss	6,300	#	3.25	20,475
* Architectural, Demo, etc.				
Floor	0	SF	3.00	0
Roof	7,060	SF	3.25	28,064
Subtotal				63,915
5. Transverse Shear Frame:				
Concrete, Grade Beams,	21	CY	650.00	13,650
Concrete, Piers	3	EA	720.00	2,160
Concrete, Columns	0	CY	750.00	0
Concrete, Girders	0	CY	750.00	0
Concrete, Foundation Mat	0	CY	550.00	0
Concrete, Pilasters	0	CY	650.00	0
Concrete, Shear Walls	0	CY	700.00	0
Shotcrete, Walls	0	SF	12.96	0
Structural, Steel	5,321	#	3.10	16,495
* Architectural, Demolition & Refinish	1	LS	8,076.28	8,076
Subtotal				40,381
6. Longitudinal Shear Frame:				
Concrete, Grade Beams,	0	CY	650.00	0
Concrete, Piers	0	EA	720.00	0
Concrete, Columns	0	CY	750.00	0
Concrete, Girders	0	CY	750.00	0
Concrete, Foundation Mat	0	CY	550.00	0
Concrete, Pilasters	0	CY	650.00	0
Concrete, Shear Walls	0	CY	700.00	0
Shotcrete, Walls	0	SF	12.96	0
Structural, Steel	0	#	3.10	0
* Architectural, Demolition & Refinish	0	LS	0.00	0
Subtotal				0

Structural Costs		$$/SF of Bldg	$8.43	$131,796
* Architectural Costs		$$/SF of Bldg	$3.08	$48,180
Total Costs	105%S + 100%A	$$/SF of Bldg	$11.93	$186,566

U R M Seismic Study

04-Dec-86

Building 1 LEVEL 1
Scenario 2
SF 15,634

	Description	QTY.	Unit	Unit Price	Total
	0. Seismic Separation Cut:				
	Structural	0	LF	66.00	0
*	Architectural	0	LF	50.00	0
	Note: Added walls incl. in sections. 5 & 6				
	Subtotal				$0
	1. Anchorage, Shear Bolts, Chords & Collectors:				
	Structural	688	LF	55.00	37,840
*	Architectural, Demolition & Replace Finish	688	LF	14.25	9,804
	Subtotal				47,644
	2. Parapet Bracing:				
	Structural	344	LF	55.00	18,920
	3. Out Of Plane Bracing:				
	Structural	344	LF	20.00	6,880
*	Architectural - Demolition & Refinish	344	LF	6.50	2,236
	Subtotal				9,116
	4. Diaphragm:				
	Structural, Plywood, Roofs	7,060	SF	2.10	14,826
	Structural, Plywood, Floors	0	SF	2.60	0
	Structural, 2" x 16 GA straps	220	LF	2.50	550
	Structural, Steel Truss	6,300	#	3.25	20,475
*	Architectural, Demo, etc.				
	Floor	0	SF	3.00	0
	Roof	7,060	SF	3.25	28,064
	Subtotal				63,915
	5. Transverse Shear Frame:				
	Concrete, Grade Beams,	18	CY	650.00	11,700
	Concrete, Piers	6	EA	720.00	4,320
	Concrete, Columns	30	CY	750.00	22,500
	Concrete, Girders	0	CY	750.00	0
	Concrete, Foundation Mat	0	CY	550.00	0
	Concrete, Pilasters	0	CY	650.00	0
	Concrete, Shear Walls	0	CY	700.00	0
	Shotcrete, Walls	0	SF	12.96	0
	Structural, Steel	0	#	3.10	0
*	Architectural, Demolition & Refinish	1	LS	9,630.00	9,630
	Subtotal				48,150
	6. Longitudinal Shear Frame:				
	Concrete, Grade Beams,	0	CY	650.00	0
	Concrete, Piers	0	EA	720.00	0
	Concrete, Columns	0	CY	750.00	0
	Concrete, Girders	0	CY	750.00	0
	Concrete, Foundation Mat	0	CY	550.00	0
	Concrete, Pilasters	0	CY	650.00	0
	Concrete, Shear Walls	0	CY	700.00	0
	Shotcrete, Walls	0	SF	12.96	0
	Structural, Steel	0	#	3.10	0
*	Architectural, Demolition & Refinish	0	LS	0.00	0
	Subtotal				0
	Structural Costs	$$/SF of Bldg		$8.83	$138,011
*	Architectural Costs	$$/SF of Bldg		$3.18	$49,734
	Total Costs 105%S + 100%A	$$/SF of Bldg		$12.45	$194,645

U R M Seismic Study

04-Dec-86

Building 1 LEVEL 2
Scenario 3
SF 15,634

Description	QTY.	Unit	Unit Price	Total
0. Seismic Separation Cut:				
Structural	0	LF	66.00	0
* Architectural	0	LF	50.00	0
Note: Added walls incl. in sections. 5 & 6				
Subtotal				$0
1. Anchorage, Shear Bolts, Chords & Collectors:				
Structural	688	LF	55.00	37,840
* Architectural, Demolition & Replace Finish	688	LF	14.25	9,804
Subtotal				47,644
2. Parapet Bracing:				
Structural	344	LF	55.00	18,920
3. Out Of Plane Bracing:				
Structural	344	LF	20.00	6,880
* Architectural - Demolition & Refinish	344	LF	6.50	2,236
Subtotal				9,116
4. Diaphragm:				
Structural, Plywood, Roofs	7,060	SF	2.10	14,826
Structural, Plywood, Floors	1,040	SF	2.60	2,704
Structural, 2" x 16 GA straps	220	LF	2.50	550
Structural, Steel Truss	6,300	#	3.25	20,475
* Architectural, Demo, etc.				
Floor	1,040	SF	3.00	3,120
Roof	7,060	SF	3.25	28,064
Subtotal				69,739
5. Transverse Shear Frame:				
Concrete, Grade Beams,	0	CY	650.00	0
Concrete, Piers	3	EA	720.00	2,160
Concrete, Columns	0	CY	750.00	0
Concrete, Girders	0	CY	750.00	0
Concrete, Foundation Mat	30	CY	550.00	16,500
Concrete, Pilasters	28	CY	650.00	17,940
Concrete, Shear Walls	0	CY	700.00	0
Shotcrete, Walls	0	SF	12.96	0
Structural, Steel	35,099	#	3.10	108,807
* Architectural, Demolition & Refinish	1	LS	36,351.73	36,352
Subtotal				181,759
6. Longitudinal Shear Frame:				
Concrete, Grade Beams,	0	CY	650.00	0
Concrete, Piers	0	EA	720.00	0
Concrete, Columns	0	CY	750.00	0
Concrete, Girders	0	CY	750.00	0
Concrete, Foundation Mat	0	CY	550.00	0
Concrete, Pilasters	0	CY	650.00	0
Concrete, Shear Walls	0	CY	700.00	0
Shotcrete, Walls	0	SF	12.96	0
Structural, Steel	0	#	3.10	0
* Architectural, Demolition & Refinish	0	LS	0.00	0
Subtotal				0
Structural Costs	$$/SF of Bldg		$15.84	$247,602
* Architectural Costs	$$/SF of Bldg		$5.09	$79,575
Total Costs 105%S + 100%A	$$/SF of Bldg		$21.72	$339,557

U R M Seismic Study

04-Dec-86

Building 2 LEVEL 1
Scenario 5
SF 15,405

Description	QTY.	Unit	Unit Price	Total
0. Seismic Separation Cut:				
Structural	0	LF	66.00	0
* Architectural	0	LF	50.00	0
Note: Added walls incl. in sections. 5 & 6				
Subtotal				$0
1. Anchorage, Shear Bolts, Chords & Collectors:				
Structural	1,224	LF	55.00	67,320
* Architectural, Demolition & Replace Finish	1,224	LF	14.25	17,442
Subtotal				84,762
2. Parapet Bracing:				
Structural	304	LF	55.00	16,720
3. Out Of Plane Bracing:				
Structural	304	LF	20.00	6,080
* Architectural - Demolition & Refinish	304	LF	6.50	1,976
Subtotal				8,056
4. Diaphragm:				
Structural, Plywood, Roofs	1,275	SF	2.10	2,678
Structural, Plywood, Floors	3,825	SF	2.60	9,945
Structural, 2" x 16 GA straps	534	LF	2.50	1,335
Structural, Steel Truss	0	#	3.25	0
* Architectural, Demo, etc.				
Floor	3,825	SF	3.00	11,475
Roof	1,500	SF	3.25	4,875
Subtotal				30,308
5. Transverse Shear Frame:				
Concrete, Grade Beams,	24	CY	650.00	15,600
Concrete, Piers	0	EA	720.00	0
Concrete, Columns	0	CY	750.00	0
Concrete, Girders	0	CY	750.00	0
Concrete, Foundation Mat	0	CY	550.00	0
Concrete, Pilasters	0	CY	650.00	0
Concrete, Shear Walls	0	CY	700.00	0
Shotcrete, Walls	0	SF	12.96	0
Structural, Steel	18,009	#	3.10	55,828
* Architectural, Demolition & Refinish	1	LS	17,856.98	17,857
Subtotal				89,285
6. Longitudinal Shear Frame:				
Concrete, Grade Beams,	0	CY	650.00	0
Concrete, Piers	0	EA	720.00	0
Concrete, Columns	0	CY	750.00	0
Concrete, Girders	0	CY	750.00	0
Concrete, Foundation Mat	0	CY	550.00	0
Concrete, Pilasters	0	CY	650.00	0
Concrete, Shear Walls	0	CY	700.00	0
Shotcrete, Walls	0	SF	12.96	0
Structural, Steel	0	#	3.10	0
* Architectural, Demolition & Refinish	0	LS	0.00	0
Subtotal				0
Structural Costs	$$/SF of Bldg		$11.39	$175,505
* Architectural Costs	$$/SF of Bldg		$3.48	$53,625
Total Costs 105%S + 100%A	$$/SF of Bldg		$15.44	$237,906

U R M Seismic Study

04-Dec-86

Building 2 LEVEL 1
Scenario 6
SF 15,405

	Description	QTY.	Unit	Unit Price	Total
	0. Seismic Separation Cut:				
	Structural	0	LF	66.00	0
*	Architectural	0	LF	50.00	0
	Note: Added walls incl. in sections. 5 & 6				
	Subtotal				$0
	1. Anchorage, Shear Bolts, Chords & Collectors:				
	Structural	1,224	LF	55.00	67,320
*	Architectural, Demolition & Replace Finish	1,224	LF	14.25	17,442
	Subtotal				84,762
	2. Parapet Bracing:				
	Structural	304	LF	55.00	16,720
	3. Out Of Plane Bracing:				
	Structural	304	LF	20.00	6,080
*	Architectural - Demolition & Refinish	304	LF	6.50	1,976
	Subtotal				8,056
	4. Diaphragm:				
	Structural, Plywood, Roofs	1,275	SF	2.10	2,678
	Structural, Plywood, Floors	3,825	SF	2.60	9,945
	Structural, 2" x 16 GA straps	534	LF	2.50	1,335
	Structural, Steel Truss	0	#	3.25	0
*	Architectural, Demo, etc.				
	Floor	3,825	SF	3.00	11,475
	Roof	1,500	SF	3.25	4,875
	Subtotal				30,308
	5. Transverse Shear Frame:				
	Concrete, Grade Beams,	37	CY	650.00	24,050
	Concrete, Piers	0	EA	720.00	0
	Concrete, Columns	0	CY	750.00	0
	Concrete, Girders	0	CY	750.00	0
	Concrete, Foundation Mat	0	CY	550.00	0
	Concrete, Pilasters	0	CY	650.00	0
	Concrete, Shear Walls	60	CY	700.00	42,000
	Shotcrete, Walls	0	SF	12.96	0
	Structural, Steel	1,200	#	3.10	3,720
*	Architectural, Demolition & Refinish	1	LS	27,942.50	27,943
	Subtotal				97,713
	6. Longitudinal Shear Frame:				
	Concrete, Grade Beams,	0	CY	650.00	0
	Concrete, Piers	0	EA	720.00	0
	Concrete, Columns	0	CY	750.00	0
	Concrete, Girders	0	CY	750.00	0
	Concrete, Foundation Mat	0	CY	550.00	0
	Concrete, Pilasters	0	CY	650.00	0
	Concrete, Shear Walls	0	CY	700.00	0
	Shotcrete, Walls	0	SF	12.96	0
	Structural, Steel	0	#	3.10	0
*	Architectural, Demolition & Refinish	0	LS	0.00	0
	Subtotal				0

	Structural Costs	$$/SF of Bldg	$11.29	$173,848
*	Architectural Costs	$$/SF of Bldg	$4.14	$63,711
	Total Costs 105%S + 100%A	$$/SF of Bldg	$15.99	$246,250

U R M Seismic Study

04-Dec-86

Building 2 LEVEL 2
Scenario 7
SF 15,405

Description	QTY.	Unit	Unit Price	Total
0. Seismic Separation Cut:				
Structural	0	LF	66.00	0
* Architectural	0	LF	50.00	0
Note: Added walls incl. in sections. 5 & 6				
Subtotal				$0
1. Anchorage, Shear Bolts, Chords & Collectors:				
Structural	1,224	LF	55.00	67,320
* Architectural, Demolition & Replace Finish	1,224	LF	14.25	17,442
Subtotal				84,762
2. Parapet Bracing:				
Structural	304	LF	55.00	16,720
3. Out Of Plane Bracing:				
Structural	304	LF	20.00	6,080
* Architectural - Demolition & Refinish	304	LF	6.50	1,976
Subtotal				8,056
4. Diaphragm:				
Structural, Plywood, Roofs	1,275	SF	2.10	2,678
Structural, Plywood, Floors	3,825	SF	2.60	9,945
Structural, 2" x 16 GA straps	534	LF	2.50	1,335
Structural, Steel Truss	0	#	3.25	0
* Architectural, Demo, etc.				
Floor	3,825	SF	3.00	11,475
Roof	1,500	SF	3.25	4,875
Subtotal				30,308
5. Transverse Shear Frame:				
Concrete, Grade Beams,	24	CY	650.00	15,600
Concrete, Piers	0	EA	720.00	0
Concrete, Columns	0	CY	750.00	0
Concrete, Girders	0	CY	750.00	0
Concrete, Foundation Mat	0	CY	550.00	0
Concrete, Pilasters	25	CY	650.00	16,250
Concrete, Shear Walls	0	CY	700.00	0
Shotcrete, Walls	0	SF	12.96	0
Structural, Steel	27,288	#	3.10	84,593
* Architectural, Demolition & Refinish	1	LS	29,110.70	29,111
Subtotal				145,554
6. Longitudinal Shear Frame:				
Concrete, Grade Beams,	0	CY	650.00	0
Concrete, Piers	0	EA	720.00	0
Concrete, Columns	0	CY	750.00	0
Concrete, Girders	0	CY	750.00	0
Concrete, Foundation Mat	0	CY	550.00	0
Concrete, Pilasters	0	CY	650.00	0
Concrete, Shear Walls	0	CY	700.00	0
Shotcrete, Walls	936	SF	12.96	12,131
Structural, Steel	0	#	3.10	0
* Architectural, Demolition & Refinish	1	LS	4,245.70	4,246
Subtotal				16,376
Structural Costs		$$/SF of Bldg	$15.10	$232,651
* Architectural Costs		$$/SF of Bldg	$4.49	$69,124
Total Costs 105%S + 100%A		$$/SF of Bldg	$20.34	$313,408

U R M Seismic Study

04-Dec-86

Building 2 LEVEL 2
Scenario 8
SF 15,405

	Description	QTY.	Unit	Unit Price	Total
	0. Seismic Separation Cut:				
	Structural	0	LF	66.00	0
*	Architectural	0	LF	50.00	0
	Note: Added walls incl. in sections. 5 & 6				
	Subtotal				$0
	1. Anchorage, Shear Bolts, Chords & Collectors:				
	Structural	1,224	LF	55.00	67,320
*	Architectural, Demolition & Replace Finish	1,224	LF	14.25	17,442
	Subtotal				84,762
	2. Parapet Bracing:				
	Structural	304	LF	55.00	16,720
	3. Out Of Plane Bracing:				
	Structural	304	LF	20.00	6,080
*	Architectural - Demolition & Refinish	304	LF	6.50	1,976
	Subtotal				8,056
	4. Diaphragm:				
	Structural, Plywood, Roofs	1,275	SF	2.10	2,678
	Structural, Plywood, Floors	3,825	SF	2.60	9,945
	Structural, 2" x 16 GA straps	534	LF	2.50	1,335
	Structural, Steel Truss	0	#	3.25	0
*	Architectural, Demo, etc.				
	Floor	3,825	SF	3.00	11,475
	Roof	1,500	SF	3.25	4,875
	Subtotal				30,308
	5. Transverse Shear Frame:				
	Concrete, Grade Beams,	37	CY	650.00	24,050
	Concrete, Piers	0	EA	720.00	0
	Concrete, Columns	93	CY	750.00	69,750
	Concrete, Girders	78	CY	750.00	58,500
	Concrete, Foundation Mat	0	CY	550.00	0
	Concrete, Pilasters	0	CY	650.00	0
	Concrete, Shear Walls	0	CY	700.00	0
	Shotcrete, Walls	0	SF	12.96	0
	Structural, Steel	0	#	3.10	0
*	Architectural, Demolition & Refinish	1	LS	38,075.00	38,075
	Subtotal				190,375
	6. Longitudinal Shear Frame:				
	Concrete, Grade Beams,	0	CY	650.00	0
	Concrete, Piers	0	EA	720.00	0
	Concrete, Columns	0	CY	750.00	0
	Concrete, Girders	0	CY	750.00	0
	Concrete, Foundation Mat	0	CY	550.00	0
	Concrete, Pilasters	0	CY	650.00	0
	Concrete, Shear Walls	0	CY	700.00	0
	Shotcrete, Walls	0	SF	12.96	0
	Structural, Steel	0	#	3.10	0
*	Architectural, Demolition & Refinish	0	LS	0.00	0
	Subtotal				0
	Structural Costs	$$/SF of Bldg		$16.64	$256,378
*	Architectural Costs	$$/SF of Bldg		$4.79	$73,843
	Total Costs 105%S + 100%A	$$/SF of Bldg		$22.27	$343,039

U R M Seismic Study

04-Dec-86

Building 2 LEVEL 3
Scenario 10
SF 15,405

	Description	QTY.	Unit	Unit Price	Total
	0. Seismic Separation Cut:				
	Structural	0	LF	66.00	0
*	Architectural	0	LF	50.00	0
	Note: Added walls incl. in sections. 5 & 6				
	Subtotal				$0
	1. Anchorage, Shear Bolts, Chords & Collectors:				
	Structural	1,224	LF	55.00	67,320
*	Architectural, Demolition & Replace Finish	1,224	LF	14.25	17,442
	Subtotal				84,762
	2. Parapet Bracing:				
	Structural	304	LF	55.00	16,720
	3. Out Of Plane Bracing:				
	Structural	0	LF	20.00	0
*	Architectural - Demolition & Refinish	0	LF	6.50	0
	Subtotal				0
	4. Diaphragm:				
	Structural, Plywood, Roofs	1,275	SF	2.10	2,678
	Structural, Plywood, Floors	3,825	SF	2.60	9,945
	Structural, 2" x 16 GA straps	534	LF	2.50	1,335
	Structural, Steel Truss	11,360	#	3.25	36,920
*	Architectural, Demo, etc.				
	Floor	3,825	SF	3.00	11,475
	Roof	1,500	SF	3.25	14,105
	Subtotal				76,458

	Description	QTY.	Unit	Unit Price	Total
	5. Transverse Shear Frame:				
	Concrete, Grade Beams,	37	CY	650.00	24,050
	Concrete, Piers	0	EA	720.00	0
	Concrete, Columns	0	CY	750.00	0
	Concrete, Girders	0	CY	750.00	0
	Concrete, Foundation Mat	0	CY	550.00	0
	Concrete, Pilasters	0	CY	650.00	0
	Concrete, Shear Walls	0	CY	700.00	0
	Shotcrete, Walls	8,280	SF	12.96	107,309
	Structural, Steel	0	#	3.10	0
*	Architectural, Demolition & Refinish	1	LS	59,666.90	59,667
	Subtotal				191,026
	6. Longitudinal Shear Frame:				
	Concrete, Grade Beams,	26	CY	650.00	16,900
	Concrete, Piers	0	EA	720.00	0
	Concrete, Columns	0	CY	750.00	0
	Concrete, Girders	0	CY	750.00	0
	Concrete, Foundation Mat	0	CY	550.00	0
	Concrete, Pilasters	0	CY	650.00	0
	Concrete, Shear Walls	0	CY	700.00	0
	Shotcrete, Walls	10,120	SF	12.96	131,155
	Structural, Steel	0	#	3.10	0
*	Architectural, Demolition & Refinish	1	LS	50,129.32	50,129
	Subtotal				198,185
	Structural Costs		$$/SF of Bldg	$26.90	$414,332
*	Architectural Costs		$$/SF of Bldg	$9.92	$152,818
	Total Costs 105%S + 100%A		$$/SF of Bldg	$38.16	$587,866

U R M Seismic Study

04-Dec-86

Building 3 LEVEL 1
Scenario 11
SF 17,429

	Description	QTY.	Unit	Unit Price	Total
	0. Seismic Separation Cut:				
	Structural	0	LF	66.00	0
*	Architectural	0	LF	50.00	0
	Note: Added walls incl. in sections. 5 & 6				
	Subtotal				$0
	1. Anchorage, Shear Bolts, Chords & Collectors:				
	Structural	1,428	LF	55.00	78,540
*	Architectural, Demolition & Replace Finish	1,428	LF	14.25	20,349
	Subtotal				98,889
	2. Parapet Bracing:				
	Structural	204	LF	55.00	11,220
	3. Out Of Plane Bracing:				
	Structural	0	LF	20.00	0
*	Architectural - Demolition & Refinish	0	LF	6.50	0
	Subtotal				0
	4. Diaphragm:				
	Structural, Plywood, Roofs	2,600	SF	2.10	5,460
	Structural, Plywood, Floors	13,000	SF	2.60	33,800
	Structural, 2" x 16 GA straps	1,908	LF	2.50	4,770
	Structural, Steel Truss	0	#	3.25	0
*	Architectural, Demo, etc.				
	Floor	13,000	SF	3.00	39,000
	Roof	2,600	SF	3.25	8,450
	Subtotal				91,480
	5. Transverse Shear Frame:				
	Concrete, Grade Beams,	14	CY	650.00	9,100
	Concrete, Piers	0	EA	720.00	0
	Concrete, Columns	0	CY	750.00	0
	Concrete, Girders	0	CY	750.00	0
	Concrete, Foundation Mat	0	CY	550.00	0
	Concrete, Pilasters	0	CY	650.00	0
	Concrete, Shear Walls	0	CY	700.00	0
	Shotcrete, Walls	0	SF	12.96	0
	Structural, Steel	21,000	#	3.10	65,100
*	Architectural, Demolition & Refinish	1	LS	18,550.00	18,550
	Subtotal				92,750
	6. Longitudinal Shear Frame:				
	Concrete, Grade Beams,	14	CY	650.00	9,100
	Concrete, Piers	0	EA	720.00	0
	Concrete, Columns	0	CY	750.00	0
	Concrete, Girders	0	CY	750.00	0
	Concrete, Foundation Mat	0	CY	550.00	0
	Concrete, Pilasters	0	CY	650.00	0
	Concrete, Shear Walls	0	CY	700.00	0
	Shotcrete, Walls	0	SF	12.96	0
	Structural, Steel	18,000	#	3.10	55,800
*	Architectural, Demolition & Refinish	1	LS	16,225.00	16,225
	Subtotal				81,125

	Structural Costs	$$/SF of Bldg	$15.66	$272,890
*	Architectural Costs	$$/SF of Bldg	$5.89	$102,574
	Total Costs 105%S + 100%A	$$/SF of Bldg	$22.33	$389,109

U R M Seismic Study

04-Dec-86

Building 3 LEVEL 1
Scenario 12
SF 17,429

Description	QTY.	Unit	Unit Price	Total
0. Seismic Separation Cut:				
Structural	0	LF	66.00	0
* Architectural	0	LF	50.00	0
Note: Added walls incl. in sections. 5 & 6				
Subtotal				$0
1. Anchorage, Shear Bolts, Chords & Collectors:				
Structural	1,428	LF	55.00	78,540
* Architectural, Demolition & Replace Finish	1,428	LF	14.25	20,349
Subtotal				98,889
2. Parapet Bracing:				
Structural	204	LF	55.00	11,220
3. Out Of Plane Bracing:				
Structural	0	LF	20.00	0
* Architectural - Demolition & Refinish	0	LF	6.50	0
Subtotal				0
4. Diaphragm:				
Structural, Plywood, Roofs	2,600	SF	2.10	5,460
Structural, Plywood, Floors	13,000	SF	2.60	33,800
Structural, 2" x 16 GA straps	1,908	LF	2.50	4,770
Structural, Steel Truss	0	#	3.25	0
* Architectural, Demo, etc.				
Floor	13,000	SF	3.00	39,000
Roof	2,600	SF	3.25	8,450
Subtotal				91,480
5. Transverse Shear Frame:				
Concrete, Grade Beams,	14	CY	650.00	9,100
Concrete, Piers	3	EA	720.00	2,160
Concrete, Columns	0	CY	750.00	0
Concrete, Girders	0	CY	750.00	0
Concrete, Foundation Mat	0	CY	550.00	0
Concrete, Pilasters	0	CY	650.00	0
Concrete, Shear Walls	46	CY	700.00	32,200
Shotcrete, Walls	0	SF	12.96	0
Structural, Steel	12,960	#	3.10	40,176
* Architectural, Demolition & Refinish	1	LS	28,959.00	28,959
Subtotal				112,595
6. Longitudinal Shear Frame:				
Concrete, Grade Beams,	0	CY	650.00	0
Concrete, Piers	0	EA	720.00	0
Concrete, Columns	0	CY	750.00	0
Concrete, Girders	0	CY	750.00	0
Concrete, Foundation Mat	0	CY	550.00	0
Concrete, Pilasters	0	CY	650.00	0
Concrete, Shear Walls	0	CY	700.00	0
Shotcrete, Walls	1,568	SF	12.96	20,321
Structural, Steel	0	#	3.10	0
* Architectural, Demolition & Refinish	1	LS	7,112.45	7,112
Subtotal				27,434
Structural Costs	$$/SF of Bldg		$13.64	$237,747
* Architectural Costs	$$/SF of Bldg		$5.96	$103,870
Total Costs 105%S + 100%A	$$/SF of Bldg		$20.28	$353,505

U R M Seismic Study

04-Dec-86

Building 3 LEVEL 2
Scenario 13
SF 17,429

Description	QTY.	Unit	Unit Price	Total
0. Seismic Separation Cut:				
Structural	0	LF	66.00	0
* Architectural	0	LF	50.00	0
Note: Added walls incl. in sections. 5 & 6				
Subtotal				$0
1. Anchorage, Shear Bolts, Chords & Collectors:				
Structural	1,428	LF	55.00	78,540
* Architectural, Demolition & Replace Finish	1,428	LF	14.25	20,349
Subtotal				98,889
2. Parapet Bracing:				
Structural	204	LF	55.00	11,220
3. Out Of Plane Bracing:				
Structural	0	LF	20.00	0
* Architectural - Demolition & Refinish	0	LF	6.50	0
Subtotal				0
4. Diaphragm:				
Structural, Plywood, Roofs	2,600	SF	2.10	5,460
Structural, Plywood, Floors	13,000	SF	2.60	33,800
Structural, 2" x 16 GA straps	1,908	LF	2.50	4,770
Structural, Steel Truss	0	#	3.25	0
* Architectural, Demo, etc.				
Floor	13,000	SF	3.00	39,000
Roof	2,600	SF	3.25	8,450
Subtotal				91,480
5. Transverse Shear Frame:				
Concrete, Grade Beams,	14	CY	650.00	9,100
Concrete, Piers	0	EA	720.00	0
Concrete, Columns	0	CY	750.00	0
Concrete, Girders	0	CY	750.00	0
Concrete, Foundation Mat	0	CY	550.00	0
Concrete, Pilasters	0	CY	650.00	0
Concrete, Shear Walls	8	CY	700.00	5,600
Shotcrete, Walls	0	SF	12.96	0
Structural, Steel	23,709	#	3.10	73,498
* Architectural, Demolition & Refinish	1	LS	23,449.48	23,449
Subtotal				111,647
6. Longitudinal Shear Frame:				
Concrete, Grade Beams,	14	CY	650.00	9,100
Concrete, Piers	0	EA	720.00	0
Concrete, Columns	0	CY	750.00	0
Concrete, Girders	0	CY	750.00	0
Concrete, Foundation Mat	0	CY	550.00	0
Concrete, Pilasters	0	CY	650.00	0
Concrete, Shear Walls	8	CY	700.00	5,530
Shotcrete, Walls	0	SF	12.96	0
Structural, Steel	19,478	#	3.10	60,382
* Architectural, Demolition & Refinish	1	LS	19,305.95	19,306
Subtotal				94,318
Structural Costs		$$/SF of Bldg	$17.04	$297,000
* Architectural Costs		$$/SF of Bldg	$6.34	$110,554
Total Costs 105%S + 100%A		$$/SF of Bldg	$24.24	$422,404

U R M Seismic Study

04-Dec-86

Building 3 LEVEL 2
Scenario 14
SF 17,429

Description	QTY.	Unit	Unit Price	Total
0. Seismic Separation Cut:				
Structural	0	LF	66.00	0
* Architectural	0	LF	50.00	0
Note: Added walls incl. in sections. 5 & 6				
Subtotal				$0
1. Anchorage, Shear Bolts, Chords & Collectors:				
Structural	1,428	LF	55.00	78,540
* Architectural, Demolition & Replace Finish	1,428	LF	14.25	20,349
Subtotal				98,889
2. Parapet Bracing:				
Structural	204	LF	55.00	11,220
3. Out Of Plane Bracing:				
Structural	0	LF	20.00	0
* Architectural - Demolition & Refinish	0	LF	6.50	0
Subtotal				0
4. Diaphragm:				
Structural, Plywood, Roofs	2,600	SF	2.10	5,460
Structural, Plywood, Floors	13,000	SF	2.60	33,800
Structural, 2" x 16 GA straps	1,908	LF	2.50	4,770
Structural, Steel Truss	0	#	3.25	0
* Architectural, Demo, etc.				
Floor	13,000	SF	3.00	39,000
Roof	2,600	SF	3.25	8,450
Subtotal				91,480
5. Transverse Shear Frame:				
Concrete, Grade Beams,	46	CY	650.00	29,900
Concrete, Piers	0	EA	720.00	0
Concrete, Columns	0	CY	750.00	0
Concrete, Girders	0	CY	750.00	0
Concrete, Foundation Mat	0	CY	550.00	0
Concrete, Pilasters	0	CY	650.00	0
Concrete, Shear Walls	66	CY	700.00	46,200
Shotcrete, Walls	0	SF	12.96	0
Structural, Steel	18,144	#	3.10	56,246
* Architectural, Demolition & Refinish	1	LS	44,636.60	44,637
Subtotal				176,983
6. Longitudinal Shear Frame:				
Concrete, Grade Beams,	0	CY	650.00	0
Concrete, Piers	0	EA	720.00	0
Concrete, Columns	0	CY	750.00	0
Concrete, Girders	0	CY	750.00	0
Concrete, Foundation Mat	0	CY	550.00	0
Concrete, Pilasters	0	CY	650.00	0
Concrete, Shear Walls	0	CY	700.00	0
Shotcrete, Walls	2,622	SF	12.96	33,981
Structural, Steel	0	#	3.10	0
* Architectural, Demolition & Refinish	1	LS	11,893.39	11,893
Subtotal				45,875
Structural Costs	$$/SF of Bldg		$17.22	$300,118
* Architectural Costs	$$/SF of Bldg		$7.13	$124,329
Total Costs 105%S + 100%A	$$/SF of Bldg		$25.21	$439,452

U R M Seismic Study

17-Dec-86

Building 4

Scenario 15

SF 12,230

LEVEL 2

Description	QTY.	Unit	Unit Price	Total
0. Seismic Separation Cut:				
Structural	0	LF	66.00	0
* Architectural	0	LF	50.00	0
Note: Added walls incl. in sections. 5 & 6				
Subtotal				$0
1. Anchorage, Shear Bolts, Chords & Collectors:				
Structural	1,028	LF	55.00	56,540
* Architectural, Demolition & Replace Finish	1,028	LF	14.25	14,649
Subtotal				71,189
2. Parapet Bracing:				
Structural	0	LF	55.00	0
3. Out Of Plane Bracing:				
Structural	0	LF	20.00	0
* Architectural - Demolition & Refinish	0	LF	6.50	0
Subtotal				0
4. Diaphragm:				
Structural, Plywood, Roofs	2,650	SF	2.10	5,565
Structural, Plywood, Floors	9,173	SF	2.60	23,850
Structural, 2" x 16 GA straps	538	LF	2.50	1,345
Structural, Steel Truss	6,195	#	3.25	20,134
* Architectural, Demo, etc.				
Floor	9,173	SF	3.00	27,519
Roof	2,650	SF	3.25	13,646
Subtotal				92,058
5. Transverse Shear Frame:				
Concrete, Grade Beams,	15	CY	650.00	9,750
Concrete, Piers	0	EA	720.00	0
Concrete, Columns	0	CY	750.00	0
Concrete, Girders	0	CY	750.00	0
Concrete, Foundation Mat	0	CY	550.00	0
Concrete, Pilasters	0	CY	650.00	0
Concrete, Shear Walls	0	CY	700.00	0
Shotcrete, Walls	578	SF	12.96	7,491
Structural, Steel	12,384	#	3.10	38,390
* Architectural, Demolition & Refinish	1	LS	15,780.54	15,781
Subtotal				71,412
6. Longitudinal Shear Frame:				
Concrete, Grade Beams,	15	CY	650.00	9,750
Concrete, Piers	0	EA	720.00	0
Concrete, Columns	0	CY	750.00	0
Concrete, Girders	0	CY	750.00	0
Concrete, Foundation Mat	0	CY	550.00	0
Concrete, Pilasters	0	CY	650.00	0
Concrete, Shear Walls	0	CY	700.00	0
Shotcrete, Walls	630	SF	12.96	8,165
Structural, Steel	12,800	#	3.10	39,680
* Architectural, Demolition & Refinish	1	LS	15,215.18	15,215
Subtotal				72,810
Structural Costs		$$/SF of Bldg	$18.04	$220,660
* Architectural Costs		$$/SF of Bldg	$7.10	$86,810
Total Costs 105%S + 100%A		$$/SF of Bldg	$26.04	$318,502

U R M Seismic Study

04-Dec-86

Building 5 LEVEL 2 LSI # 9523

Scenario 16

SF 48,542

Description	QTY.	Unit	Unit Price	Total
0. Seismic Separation Cut:				
Structural	830	LF	66.00	54,780
* Architectural	415	LF	50.00	20,750
Note: Added walls incl. in sections. 5 & 6				
Subtotal				$75,530
1. Anchorage, Shear Bolts, Chords & Collectors:				
Structural	2,920	LF	55.00	160,600
* Architectural, Demolition & Replace Finish	2,920	LF	14.25	41,610
Subtotal				202,210
2. Parapet Bracing:				
Structural	540	LF	55.00	29,700
3. Out Of Plane Bracing:				
Structural	0	LF	20.00	0
* Architectural - Demolition & Refinish	0	LF	6.50	0
Subtotal				0
4. Diaphragm:				
Structural, Plywood, Roofs	7,735	SF	2.10	16,244
Structural, Plywood, Floors	15,470	SF	2.60	40,222
Structural, 2" x 16 GA straps	2,000	LF	2.50	5,000
Structural, Steel Truss	0	#	3.25	0
* Architectural, Demo, etc.				
Floor	15,470	SF	3.00	46,410
Roof	7,735	SF	3.25	25,139
Subtotal				133,014
5. Transverse Shear Frame:				
Concrete, Grade Beams,	43	CY	650.00	27,950
Concrete, Piers	0	EA	720.00	0
Concrete, Columns	0	CY	750.00	0
Concrete, Girders	0	CY	750.00	0
Concrete, Foundation Mat	0	CY	550.00	0
Concrete, Pilasters	0	CY	650.00	0
Concrete, Shear Walls	303	CY	700.00	212,100
Shotcrete, Walls	0	SF	12.96	0
Structural, Steel	0	#	3.10	0
*. Architectural, Demolition & Refinish	1	LS	113038	113,038
Subtotal				353,088
6. Longitudinal Shear Frame:				
Concrete, Grade Beams,	43	CY	650.00	27,950
Concrete, Piers	0	EA	720.00	0
Concrete, Columns	0	CY	750.00	0
Concrete, Girders	0	CY	750.00	0
Concrete, Foundation Mat	0	CY	550.00	0
Concrete, Pilasters	0	CY	650.00	0
Concrete, Shear Walls	303	CY	700.00	212,100
Shotcrete, Walls	0	SF	12.96	0
Structural, Steel	0	#	3.10	0
* Architectural, Demolition & Refinish	1	LS	81,222.50	81,223
Subtotal				321,273
Structural Costs		$$/SF of Bldg	$16.21	$786,646
* Architectural Costs		$$/SF of Bldg	$6.76	$328,169
Total Costs	105%S + 100%A	$$/SF of Bldg	$23.78	$1,154,147

LEE SAYLOR ESTIMATE

12/ 7/86

URM SEISMIC COST STUDY SUMMARY

for
University of California

Prepared by
Lee Saylor Inc.
Project Estimators
M. Hauser & D. Mueheilsen
Checked by Lee Saylor

LEVEL	1		1		1		1	
BLDG.	1		1		2		2	
SCENARIO	1		2		5		6	
SF	15,634		15,634		15,405		15,405	
Category	$$/SF	$$	$$/SF	$$	$$/SF	$$	$$/SF	$$
0. Seismic Cut	.00	0	.00	0	.00	0	.00	0
1. Anchorage, Shear Bolts, etc.	2.31	36,168	2.31	36,168	4.18	64,346	4.18	64,346
2. Parapet Bracing	.52	8,118	.52	8,118	.47	7,174	.47	7,174
3. Out of Plane	.57	8,848	.00	0	.51	7,819	.51	7,819
4. Diaphragms	3.73	58,267	3.73	58,267	1.96	30,212	1.96	30,212
5. Transverse Shear Walls	2.30	36,010	2.78	43,528	5.13	79,039	4.81	74,052
6. Longitudinal Shear Walls	.00	0	.00	0	.00	0	.00	0
TOTALS	9.43	$147,411	9.34	$146,081	12.24	$188,590	11.92	$183,602

1		1		2		2		2	
3		3		1		2		2	
11		12		3		7		8	
17,429		17,429		15,634		15,405		15,405	
$$/SF	$$	$$/SF	$$	$$/SF	$$	$$/SF	$$	$$/SF	$$
.00	0	.00	0	.00	0	.00	0	.00	0
4.31	75,070	4.31	75,070	2.31	36,168	4.18	64,346	4.18	64,346
.28	4,814	.28	4,814	.52	8,118	.47	7,174	.47	7,174
.00	0	.00	0	.00	0	.51	7,819	.51	7,819
5.24	91,285	5.24	91,285	2.46	38,442	1.96	30,212	1.96	30,212
4.70	81,893	5.33	92,855	10.50	164,164	8.56	131,868	11.17	172,099
4.11	71,663	1.56	27,107	.00	0	1.05	16,181	.00	0
18.63	$324,725	16.70	$291,131	15.79	$246,892	16.72	$257,600	18.28	$281,650

2		2		2		2		3	
3		3		4		5		2	
13		14		15		16		10	
17,429		17,429		17,429		48,542		15,405	
$$/SF	$$	$$/SF	$$	$$/SF	$$	$$/SF	$$	$$/SF	$$
.00	0	.00	0	.00	0	1.24	60,175	.00	0
4.31	75,070	4.31	75,070	3.10	54,042	3.16	153,504	4.18	64,346
.28	4,814	.28	4,814	.00	0	.26	12,744	.47	7,174
.00	0	.00	0	.00	0	.00	0	.00	0
5.24	91,285	5.24	91,285	4.98	86,826	2.73	132,434	1.96	30,212
5.59	97,381	8.45	147,221	3.63	63,239	5.53	268,302	11.06	170,317
4.75	82,875	2.60	45,328	3.76	65,557	5.53	268,302	12.60	194,047
20.16	$351,425	20.87	$363,718	15.47	$269,664	18.45	$895,462	30.26	$466,095

U R M Seismic Study

LEE SAYLOR INC. 04-Dec-86
Building 1 LEVEL 1 LSI # 9523 M
Scenario 1
SF 15,634

Description	QTY.	Unit	Unit Price	Total
0. Seismic Separation Cut:				
Structural	0	LF	52.00	0
* Architectural	0	LF	41.00	0
Note: Added walls incl. in sections. 5 & 6				
Subtotal				$0
1. Anchorage, Shear Bolts, Chords & Collectors:				
Structural	688	LF	45.47	31,283
* Architectural, Demolition & Replace Finish	688	LF	7.10	4,885
Subtotal				36,168
2. Parapet Bracing:				
Structural	344	LF	23.60	8,118
3. Out Of Plane Bracing:				
Structural	344	LF	19.22	6,612
* Architectural - Demolition & Refinish	344	LF	6.50	2,236
Subtotal				8,848
4. Diaphragm:				
Structural, Plywood, Roofs	7,060	SF	2.03	14,297
Structural, Plywood, Floors	0	SF	2.60	0
Structural, 2" x 16 GA straps	220	LF	2.50	550
Structural, Steel Truss	6,300	#	3.25	20,475
* Architectural, Demo, etc.				
Floor	0	SF	3.00	0
Roof	7,060	SF	3.25	22,945
Subtotal				58,267

Description	QTY.	Unit	Unit Price	Total
5. Transverse Shear Frame:				
Concrete, Grade Beams,	21	CY	650.00	13,650
Concrete, Piers	3	EA	720.00	2,160
Concrete, Columns	0	CY	750.00	0
Concrete, Girders	0	CY	750.00	0
Concrete, Foundation Mat	0	CY	550.00	0
Concrete, Pilasters	0	CY	750.00	0
Concrete, Shear Walls	0	CY	625.00	0
Shotcrete, Walls	0	SF	13.83	0
Structural, Steel	5,321	#	3.10	16,495
* Architectural, Demolition & Refinish	1	LS	3,704.81	3,705
Subtotal				36,010
6. Longitudinal Shear Frame:				
Concrete, Grade Beams,	0	CY	650.00	0
Concrete, Piers	0	EA	720.00	0
Concrete, Columns	0	CY	750.00	0
Concrete, Girders	0	CY	750.00	0
Concrete, Foundation Mat	0	CY	550.00	0
Concrete, Pilasters	0	CY	750.00	0
Concrete, Shear Walls	0	CY	625.00	0
Shotcrete, Walls	0	SF	13.83	0
Structural, Steel	0	#	3.10	0
* Architectural, Demolition .& Refinish	0	LS	0.00	0
Subtotal				0
Structural Costs		$$/SF of Bldg	$7.27	$113,640
* Architectural Costs		$$/SF of Bldg	$2.16	$33,771
Total Costs		$$/SF of Bldg	$9.43	$147,411

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                        U R M   Seismic Study
LEE SAYLOR INC.                                               04-Dec-86
Building                   1         LEVEL      1             LSI # 9523 M
Scenario                   2
    SF               15,634                          Unit
    Description                          QTY.   Unit   Price         Total
-------------------------------------------------------------------------

 0. Seismic Separation Cut:

      Structural                            0   LF     52.00             0
  *   Architectural                         0   LF     41.00             0
    Note: Added walls incl. in sections. 5 & 6                 -----------
        Subtotal                                                        $0

-------------------------------------------------------------------------

 1. Anchorage, Shear Bolts,
     Chords & Collectors:

     Structural                           688   LF     45.47        31,283
  *  Architectural, Demolition
      & Replace Finish                    688   LF      7.10         4,885
                                                                -----------
      Subtotal                                                      36,168
-------------------------------------------------------------------------

 2. Parapet Bracing:

     Structural                           344   LF     23.60         8,118
-------------------------------------------------------------------------

 3. Out Of Plane Bracing:

     Structural                           344   LF     19.22             0
  *  Architectural - Demolition
      & Refinish                          344   LF      6.50             0
                                                                -----------
      Subtotal                                                           0
-------------------------------------------------------------------------

 4. Diaphragm:

     Structural, Plywood, Roofs         7,060   SF      2.03        14,297
     Structural, Plywood, Floors            0   SF      2.60             0
     Structural, 2" x 16 GA straps        220   LF      2.50           550
     Structural, Steel Truss            6,300   #       3.25        20,475
  *  Architectural, Demo, etc.
                          Floor             0   SF      3.00             0
                          Roof          7,060   SF      3.25        22,945
                                                                -----------
      Subtotal                                                      58,267
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 5. Transverse Shear Frame:

     Concrete, Grade Beams,              18   CY     650.00        11,700
     Concrete, Piers                      6   EA     720.00         4,320
     Concrete, Columns                   30   CY     750.00        22,500
     Concrete, Girders                    0   CY     750.00             0
     Concrete, Foundation Mat             0   CY     550.00             0
     Concrete, Pilasters                  0   CY     750.00             0
     Concrete, Shear Walls                0   CY     625.00             0
     Shotcrete, Walls                     0   SF      13.83             0
     Structural, Steel                    0   #        3.10             0
  *  Architectural, Demolition
      & Refinish                          1   LS   5,007.60         5,008
                                                              -----------
       Subtotal                                                    43,528
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 6. Longitudinal Shear Frame:

     Concrete, Grade Beams,               0   CY     650.00             0
     Concrete, Piers                      0   EA     720.00             0
     Concrete, Columns                    0   CY     750.00             0
     Concrete, Girders                    0   CY     750.00             0
     Concrete, Foundation Mat             0   CY     550.00             0
     Concrete, Pilasters                  0   CY     750.00             0
     Concrete, Shear Walls                0   CY     625.00             0
     Shotcrete, Walls                     0   SF      13.83             0
     Structural, Steel                    0   #        3.10             0
  *  Architectural, Demolition
      & Refinish                          0   LS       0.00             0
                                                              -----------
    Subtotal                                                            0
-------------------------------------------------------------------------

    Structural Costs              $$/SF of Bldg      $7.24      $113,243

  * Architectural Costs           $$/SF of Bldg      $2.10       $32,837

    Total Costs                   $$/SF of Bldg      $9.34      $146,081
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U R M Seismic Study

LEE SAYLOR INC. 04-Dec-86
Building 1 LEVEL 2 LSI # 9523 M
Scenario 3
SF 15,634

Description	QTY.	Unit	Unit Price	Total
0. Seismic Separation Cut:				
Structural	0	LF	52.00	0
* Architectural	0	LF	41.00	0
Note: Added walls incl. in sections. 5 & 6				
Subtotal				$0
1. Anchorage, Shear Bolts, Chords & Collectors:				
Structural	688	LF	45.47	31,283
* Architectural, Demolition & Replace Finish	688	LF	7.10	4,885
Subtotal				36,168
2. Parapet Bracing:				
Structural	344	LF	23.60	8,118
3. Out Of Plane Bracing:				
Structural	344	LF	19.22	0
* Architectural - Demolition & Refinish	344	LF	6.50	0
Subtotal				0
4. Diaphragm:				
Structural, Plywood, Roofs	7,060	SF	2.03	14,297
Structural, Plywood, Floors	1,040	SF	2.60	0
Structural, 2" x 16 GA straps	220	LF	2.50	550
Structural, Steel Truss	6,300	#	3.25	20,475
* Architectural, Demo, etc.				
Floor	1,040	SF	3.00	3,120
Roof	7,060	SF	3.25	0
Subtotal				38,442
5. Transverse Shear Frame:				
Concrete, Grade Beams,	0	CY	650.00	0
Concrete, Piers	3	EA	720.00	2,160
Concrete, Columns	0	CY	750.00	0
Concrete, Girders	0	CY	750.00	0
Concrete, Foundation Mat	30	CY	550.00	16,500
Concrete, Pilasters	28	CY	750.00	20,700
Concrete, Shear Walls	0	CY	625.00	0
Shotcrete, Walls	0	SF	13.83	0
Structural, Steel	35,099	#	3.10	108,807
* Architectural, Demolition & Refinish	1	LS	15,997.49	15,997
Subtotal				164,164
6. Longitudinal Shear Frame:				
Concrete, Grade Beams,	0	CY	650.00	0
Concrete, Piers	0	EA	720.00	0
Concrete, Columns	0	CY	750.00	0
Concrete, Girders	0	CY	750.00	0
Concrete, Foundation Mat	0	CY	550.00	0
Concrete, Pilasters	0	CY	750.00	0
Concrete, Shear Walls	0	CY	625.00	0
Shotcrete, Walls	0	SF	13.83	0
Structural, Steel	0	#	3.10	0
* Architectural, Demolition & Refinish	0	LS	0.00	0
Subtotal				0
Structural Costs	$$/SF of Bldg		$14.26	$222,890
* Architectural Costs	$$/SF of Bldg		$1.54	$24,002
Total Costs	$$/SF of Bldg		$15.79	$246,892

U R M Seismic Study

LEE SAYLOR INC. 04-Dec-86

Building 2 LEVEL 1 LSI # 9523 M

Scenario 5

SF 15,405

	Description	QTY.	Unit	Unit Price	Total
	0. Seismic Separation Cut:				
	Structural	0	LF	52.00	0
*	Architectural	0	LF	41.00	0
	Note: Added walls incl. in sections. 5 & 6				
	Subtotal				$0
	1. Anchorage, Shear Bolts, Chords & Collectors:				
	Structural	1,224	LF	45.47	55,655
*	Architectural, Demolition & Replace Finish	1,224	LF	7.10	8,690
	Subtotal				64,346
	2. Parapet Bracing:				
	Structural	304	LF	23.60	7,174
	3. Out Of Plane Bracing:				
	Structural	304	LF	19.22	5,843
*	Architectural - Demolition & Refinish	304	LF	6.50	1,976
	Subtotal				7,819
	4. Diaphragm:				
	Structural, Plywood, Roofs	1,275	SF	2.03	2,582
	Structural, Plywood, Floors	3,825	SF	2.60	9,945
	Structural, 2" x 16 GA straps	534	LF	2.50	1,335
	Structural, Steel Truss	0	#	3.25	0
*	Architectural, Demo, etc.				
	Floor	3,825	SF	3.00	11,475
	Roof	1,500	SF	3.25	4,875
	Subtotal				30,212
	5. Transverse Shear Frame:				
	Concrete, Grade Beams,	24	CY	650.00	15,600
	Concrete, Piers	0	EA	720.00	0
	Concrete, Columns	0	CY	750.00	0
	Concrete, Girders	0	CY	750.00	0
	Concrete, Foundation Mat	0	CY	550.00	0
	Concrete, Pilasters	0	CY	750.00	0
	Concrete, Shear Walls	0	CY	625.00	0
	Shotcrete, Walls	0	SF	13.83	0
	Structural, Steel	18,009	#	3.10	55,828
*	Architectural, Demolition & Refinish	1	LS	7,610.79	7,611
	Subtotal				79,039
	6. Longitudinal Shear Frame:				
	Concrete, Grade Beams,	0	CY	650.00	0
	Concrete, Piers	0	EA	720.00	0
	Concrete, Columns	0	CY	750.00	0
	Concrete, Girders	0	CY	750.00	0
	Concrete, Foundation Mat	0	CY	550.00	0
	Concrete, Pilasters	0	CY	750.00	0
	Concrete, Shear Walls	0	CY	625.00	0
	Shotcrete, Walls	0	SF	13.83	0
	Structural, Steel	0	#	3.10	0
*	Architectural, Demolition & Refinish	0	LS	0.00	0
	Subtotal				0
	Structural Costs		$$/SF of Bldg	$9.99	$153,962
*	Architectural Costs		$$/SF of Bldg	$2.25	$34,627
	Total Costs		$$/SF of Bldg	$12.24	$188,590

U R M Seismic Study

LEE SAYLOR INC. 04-Dec-86
Building 2 LEVEL 1 LSI # 9523 M
Scenario 6
SF 15,405

Description	QTY.	Unit	Unit Price	Total
0. Seismic Separation Cut:				
Structural	0	LF	52.00	0
* Architectural	0	LF	41.00	0
Note: Added walls incl. in sections. 5 & 6				
Subtotal				$0
1. Anchorage, Shear Bolts, Chords & Collectors:				
Structural	1,224	LF	45.47	55,655
* Architectural, Demolition & Replace Finish	1,224	LF	7.10	8,690
Subtotal				64,346
2. Parapet Bracing:				
Structural	304	LF	23.60	7,174
3. Out Of Plane Bracing:				
Structural	304	LF	19.22	5,843
* Architectural - Demolition & Refinish	304	LF	6.50	1,976
Subtotal				7,819
4. Diaphragm:				
Structural, Plywood, Roofs	1,275	SF	2.03	2,582
Structural, Plywood, Floors	3,825	SF	2.60	9,945
Structural, 2" x 16 GA straps	534	LF	2.50	1,335
Structural, Steel Truss	0	#	3.25	0
* Architectural, Demo, etc.				
Floor	3,825	SF	3.00	11,475
Roof	1,500	SF	3.25	4,875
Subtotal				30,212
5. Transverse Shear Frame:				
Concrete, Grade Beams,	37	CY	650.00	24,050
Concrete, Piers	0	EA	720.00	0
Concrete, Columns	0	CY	750.00	0
Concrete, Girders	0	CY	750.00	0
Concrete, Foundation Mat	0	CY	550.00	0
Concrete, Pilasters	0	CY	750.00	0
Concrete, Shear Walls	60	CY	625.00	37,500
Shotcrete, Walls	0	SF	13.83	0
Structural, Steel	1,200	#	3.10	0
* Architectural, Demolition & Refinish	1	LS	12,501.50	12,502
Subtotal				74,052
6. Longitudinal Shear Frame:				
Concrete, Grade Beams,	0	CY	650.00	0
Concrete, Piers	0	EA	720.00	0
Concrete, Columns	0	CY	750.00	0
Concrete, Girders	0	CY	750.00	0
Concrete, Foundation Mat	0	CY	550.00	0
Concrete, Pilasters	0	CY	750.00	0
Concrete, Shear Walls	0	CY	625.00	0
Shotcrete, Walls	0	SF	13.83	0
Structural, Steel	0	#	3.10	0
* Architectural, Demolition & Refinish	0	LS	0.00	0
Subtotal				0
Structural Costs	$$/SF of Bldg		$9.35	$144,084
* Architectural Costs	$$/SF of Bldg		$2.57	$39,518
Total Costs	$$/SF of Bldg		$11.92	$183,602

U R M Seismic Study

LEE SAYLOR INC. 04-Dec-86
Building 2 LEVEL 2 LSI # 9523 M
Scenario 7
SF 15,405

Description	QTY.	Unit	Unit Price	Total
0. Seismic Separation Cut:				
Structural	0	LF	52.00	0
* Architectural	0	LF	41.00	0
Note: Added walls incl. in sections. 5 & 6				
Subtotal				$0
1. Anchorage, Shear Bolts, Chords & Collectors:				
Structural	1,224	LF	45.47	55,655
* Architectural, Demolition & Replace Finish	1,224	LF	7.10	8,690
Subtotal				64,346
2. Parapet Bracing:				
Structural	304	LF	23.60	7,174
3. Out Of Plane Bracing:				
Structural	304	LF	19.22	5,843
* Architectural - Demolition & Refinish	304	LF	6.50	1,976
Subtotal				7,819
4. Diaphragm:				
Structural, Plywood, Roofs	1,275	SF	2.03	2,582
Structural, Plywood, Floors	3,825	SF	2.60	9,945
Structural, 2" x 16 GA straps	534	LF	2.50	1,335
Structural, Steel Truss	0	#	3.25	0
* Architectural, Demo, etc.				
Floor	3,825	SF	3.00	11,475
Roof	1,500	SF	3.25	4,875
Subtotal				30,212
5. Transverse Shear Frame:				
Concrete, Grade Beams,	24	CY	650.00	15,600
Concrete, Piers	0	EA	720.00	0
Concrete, Columns	0	CY	750.00	0
Concrete, Girders	0	CY	750.00	0
Concrete, Foundation Mat	0	CY	550.00	0
Concrete, Pilasters	25	CY	750.00	18,750
Concrete, Shear Walls	0	CY	625.00	0
Shotcrete, Walls	0	SF	13.83	0
Structural, Steel	27,288	#	3.10	84,593
* Architectural, Demolition & Refinish	1	LS	12,924.78	12,925
Subtotal				131,868
6. Longitudinal Shear Frame:				
Concrete, Grade Beams,	0	CY	650.00	0
Concrete, Piers	0	EA	720.00	0
Concrete, Columns	0	CY	750.00	0
Concrete, Girders	0	CY	750.00	0
Concrete, Foundation Mat	0	CY	550.00	0
Concrete, Pilasters	0	CY	750.00	0
Concrete, Shear Walls	0	CY	625.00	0
Shotcrete, Walls	936	SF	13.83	12,945
Structural, Steel	0	#	3.10	0
* Architectural, Demolition & Refinish	1	LS	3,236.22	3,236
Subtotal				16,181
Structural Costs	$$/SF of Bldg		$13.92	$214,422
* Architectural Costs	$$/SF of Bldg		$2.80	$43,177
Total Costs	$$/SF of Bldg		$16.72	$257,600

U R M Seismic Study

LEE SAYLOR INC. 04-Dec-86
Building 2 LEVEL 2 LSI # 9523 M
Scenario 8
SF 15,405

Description	QTY.	Unit	Unit Price	Total
0. Seismic Separation Cut:				
Structural	0	LF	52.00	0
* Architectural	0	LF	41.00	0
Note: Added walls incl. in sections. 5 & 6				
Subtotal				$0
1. Anchorage, Shear Bolts, Chords & Collectors:				
Structural	1,224	LF	45.47	55,655
* Architectural, Demolition & Replace Finish	1,224	LF	7.10	8,690
Subtotal				64,346
2. Parapet Bracing:				
Structural	304	LF	23.60	7,174
3. Out Of Plane Bracing:				
Structural	304	LF	19.22	5,843
* Architectural - Demolition & Refinish	304	LF	6.50	1,976
Subtotal				7,819
4. Diaphragm:				
Structural, Plywood, Roofs	1,275	SF	2.03	2,582
Structural, Plywood, Floors	3,825	SF	2.60	9,945
Structural, 2" x 16 GA straps	534	LF	2.50	1,335
Structural, Steel Truss	0	#	3.25	0
* Architectural, Demo, etc.				
Floor	3,825	SF	3.00	11,475
Roof	1,500	SF	3.25	4,875
Subtotal				30,212

5. Transverse Shear Frame:				
Concrete, Grade Beams,	37	CY	650.00	24,050
Concrete, Piers	0	EA	720.00	0
Concrete, Columns	93	CY	750.00	69,750
Concrete, Girders	78	CY	750.00	58,500
Concrete, Foundation Mat	0	CY	550.00	0
Concrete, Pilasters	0	CY	750.00	0
Concrete, Shear Walls	0	CY	625.00	0
Shotcrete, Walls	0	SF	13.83	0
Structural, Steel	0	#	3.10	0
* Architectural, Demolition & Refinish	1	LS	19,799.00	19,799
Subtotal				172,099
6. Longitudinal Shear Frame:				
Concrete, Grade Beams,	0	CY	650.00	0
Concrete, Piers	0	EA	720.00	0
Concrete, Columns	0	CY	750.00	0
Concrete, Girders	0	CY	750.00	0
Concrete, Foundation Mat	0	CY	550.00	0
Concrete, Pilasters	0	CY	750.00	0
Concrete, Shear Walls	0	CY	625.00	0
Shotcrete, Walls	0	SF	13.83	0
Structural, Steel	0	#	3.10	0
* Architectural, Demolition & Refinish	0	LS	0.00	0
Subtotal				0
Structural Costs	$$/SF of Bldg		$15.24	$234,834
* Architectural Costs	$$/SF of Bldg		$3.04	$46,815
Total Costs	$$/SF of Bldg		$18.28	$281,650

U R M Seismic Study

LEE SAYLOR INC. 04-Dec-86

Building 2 LEVEL 3 LSI # 9523 M

Scenario 10

SF 15,405

Description	QTY.	Unit	Unit Price	Total
0. Seismic Separation Cut:				
Structural	0	LF	52.00	0
* Architectural	0	LF	41.00	.0
Note: Added walls incl. in sections. 5 & 6				
Subtotal				$0
1. Anchorage, Shear Bolts, Chords & Collectors:				
Structural	1,224	LF	45.47	55,655
* Architectural, Demolition & Replace Finish	1,224	LF	7.10	8,690
Subtotal				64,346
2. Parapet Bracing:				
Structural	304	LF	23.60	7,174
3. Out Of Plane Bracing:				
Structural	0	LF	19.22	0
* Architectural - Demolition & Refinish	0	LF	6.50	0
Subtotal				0
4. Diaphragm:				
Structural, Plywood, Roofs	1,275	SF	2.03	2,582
Structural, Plywood, Floors	3,825	SF	2.60	9,945
Structural, 2" x 16 GA straps	534	LF	2.50	1,335
Structural, Steel Truss	11,360	#	3.25	0
* Architectural, Demo, etc.				
Floor	3,825	SF	3.00	11,475
Roof	1,500	SF	3.25	4,875
Subtotal				30,212

Description	QTY.	Unit	Unit Price	Total
5. Transverse Shear Frame:				
Concrete, Grade Beams,	37	CY	650.00	24,050
Concrete, Piers	0	EA	720.00	0
Concrete, Columns	0	CY	750.00	0
Concrete, Girders	0	CY	750.00	0
Concrete, Foundation Mat	0	CY	550.00	0
Concrete, Pilasters	0	CY	750.00	0
Concrete, Shear Walls	0	CY	625.00	0
Shotcrete, Walls	8,280	SF	13.83	114,512
Structural, Steel	0	#	3.10	0
* Architectural, Demolition & Refinish	1	LS	31,754.60	31,755
Subtotal				170,317
6. Longitudinal Shear Frame:				
Concrete, Grade Beams,	26	CY	650.00	16,900
Concrete, Piers	0	EA	720.00	0
Concrete, Columns	0	CY	750.00	0
Concrete, Girders	0	CY	750.00	0
Concrete, Foundation Mat	0	CY	550.00	0
Concrete, Pilasters	0	CY	750.00	0
Concrete, Shear Walls	0	CY	625.00	0
Shotcrete, Walls	10,120	SF	13.83	139,960
Structural, Steel	0	#	3.10	0
* Architectural, Demolition & Refinish	1	LS	37,186.90	37,187
Subtotal				194,047
Structural Costs	$$/SF of Bldg		$24.16	$372,114
* Architectural Costs	$$/SF of Bldg		$6.10	$93,982
Total Costs	$$/SF of Bldg		$30.26	$466,095

U R M Seismic Study

LEE SAYLOR INC. 04-Dec-86
Building 3 LEVEL 1 LSI # 9523 M
Scenario 11
SF 17,429

Description	QTY.	Unit	Unit Price	Total
0. Seismic Separation Cut:				
Structural	0	LF	52.00	0
* Architectural	0	LF	41.00	0
Note: Added walls incl. in sections. 5 & 6				
Subtotal				$0
1. Anchorage, Shear Bolts, Chords & Collectors:				
Structural	1,428	LF	45.47	64,931
* Architectural, Demolition & Replace Finish	1,428	LF	7.10	10,139
Subtotal				75,070
2. Parapet Bracing:				
Structural	204	LF	23.60	4,814
3. Out Of Plane Bracing:				
Structural	0	LF	19.22	0
* Architectural - Demolition & Refinish	0	LF	6.50	0
Subtotal				0
4. Diaphragm:				
Structural, Plywood, Roofs	2,600	SF	2.03	5,265
Structural, Plywood, Floors	13,000	SF	2.60	33,800
Structural, 2" x 16 GA straps	1,908	LF	2.50	4,770
Structural, Steel Truss	0	#	3.25	0
* Architectural, Demo, etc.				
Floor	13,000	SF	3.00	39,000
Roof	2,600	SF	3.25	8,450
Subtotal				91,285

Description	QTY.	Unit	Unit Price	Total
5. Transverse Shear Frame:				
Concrete, Grade Beams,	14	CY	650.00	9,100
Concrete, Piers	0	EA	720.00	0
Concrete, Columns	0	CY	750.00	0
Concrete, Girders	0	CY	750.00	0
Concrete, Foundation Mat	0	CY	550.00	0
Concrete, Pilasters	0	CY	750.00	0
Concrete, Shear Walls	0	CY	625.00	0
Shotcrete, Walls	0	SF	13.83	0
Structural, Steel	21,000	#	3.10	65,100
* Architectural, Demolition & Refinish	1	LS	7,693.00	7,693
Subtotal				81,893
6. Longitudinal Shear Frame:				
Concrete, Grade Beams,	14	CY	650.00	9,100
Concrete, Piers	0	EA	720.00	0
Concrete, Columns	0	CY	750.00	0
Concrete, Girders	0	CY	750.00	0
Concrete, Foundation Mat	0	CY	550.00	0
Concrete, Pilasters	0	CY	750.00	0
Concrete, Shear Walls	0	CY	625.00	0
Shotcrete, Walls	0	SF	13.83	0
Structural, Steel	18,000	#	3.10	55,800
* Architectural, Demolition & Refinish	1	LS	6,763.00	6,763
Subtotal				71,663
Structural Costs	$$/SF of Bldg		$14.50	$252,681
* Architectural Costs	$$/SF of Bldg		$4.13	$72,045
Total Costs	$$/SF of Bldg		$18.63	$324,725

U R M Seismic Study

LEE SAYLOR INC. 04-Dec-86
Building 3 LEVEL 1 LSI # 9523 M
Scenario 12
SF 17,429

Description	QTY.	Unit	Unit Price	Total
0. Seismic Separation Cut:				
Structural	0	LF	52.00	0
* Architectural	0	LF	41.00	0
Note: Added walls incl. in sections. 5 & 6				
Subtotal				$0
1. Anchorage, Shear Bolts, Chords & Collectors:				
Structural	1,428	LF	45.47	64,931
* Architectural, Demolition & Replace Finish	1,428	LF	7.10	10,139
Subtotal				75,070
2. Parapet Bracing:				
Structural	204	LF	23.60	4,814
3. Out Of Plane Bracing:				
Structural	0	LF	19.22	0
* Architectural - Demolition & Refinish	0	LF	6.50	0
Subtotal				0
4. Diaphragm:				
Structural, Plywood, Roofs	2,600	SF	2.03	5,265
Structural, Plywood, Floors	13,000	SF	2.60	33,800
Structural, 2" x 16 GA straps	1,908	LF	2.50	4,770
Structural, Steel Truss	0	#	3.25	0
* Architectural, Demo, etc.				
Floor	13,000	SF	3.00	39,000
Roof	2,600	SF	3.25	8,450
Subtotal				91,285
5. Transverse Shear Frame:				
Concrete, Grade Beams,	14	CY	650.00	9,100
Concrete, Piers	3	EA	720.00	2,160
Concrete, Columns	0	CY	750.00	0
Concrete, Girders	0	CY	750.00	0
Concrete, Foundation Mat	0	CY	550.00	0
Concrete, Pilasters	0	CY	750.00	0
Concrete, Shear Walls	46	CY	625.00	28,750
Shotcrete, Walls	0	SF	13.83	0
Structural, Steel	12,960	#	3.10	40,176
* Architectural, Demolition & Refinish	1	LS	12,668.90	12,669
Subtotal				92,855
6. Longitudinal Shear Frame:				
Concrete, Grade Beams,	0	CY	650.00	0
Concrete, Piers	0	EA	720.00	0
Concrete, Columns	0	CY	750.00	0
Concrete, Girders	0	CY	750.00	0
Concrete, Foundation Mat	0	CY	550.00	0
Concrete, Pilasters	0	CY	750.00	0
Concrete, Shear Walls	0	CY	625.00	0
Shotcrete, Walls	1,568	SF	13.83	21,685
Structural, Steel	0	#	3.10	0
* Architectural, Demolition & Refinish	1	LS	5,421.36	5,421
Subtotal				27,107
Structural Costs	$$/SF of Bldg		$12.36	$215,452
* Architectural Costs	$$/SF of Bldg		$4.34	$75,679
Total Costs	$$/SF of Bldg		$16.70	$291,131

U R M Seismic Study

LEE SAYLOR INC. 04-Dec-86
Building 3 LEVEL 2 LSI # 9523 M
Scenario 13
SF 17,429

	Description	QTY.	Unit	Unit Price	Total
	0. Seismic Separation Cut:				
	Structural	0	LF	52.00	0
*	Architectural	0	LF	41.00	0
	Note: Added walls incl. in sections. 5 & 6				
	Subtotal				$0
	1. Anchorage, Shear Bolts, Chords & Collectors:				
	Structural	1,428	LF	45.47	64,931
*	Architectural, Demolition & Replace Finish	1,428	LF	7.10	10,139
	Subtotal				75,070
	2. Parapet Bracing:				
	Structural	204	LF	23.60	4,814
	3. Out Of Plane Bracing:				
	Structural	0	LF	19.22	0
*	Architectural - Demolition & Refinish	0	LF	6.50	0
	Subtotal				0
	4. Diaphragm:				
	Structural, Plywood, Roofs	2,600	SF	2.03	5,265
	Structural, Plywood, Floors	13,000	SF	2.60	33,800
	Structural, 2" x 16 GA straps	1,908	LF	2.50	4,770
	Structural, Steel Truss	0	#	3.25	0
*	Architectural, Demo, etc.				
	Floor	13,000	SF	3.00	39,000
	Roof	2,600	SF	3.25	8,450
	Subtotal				91,285
	5. Transverse Shear Frame:				
	Concrete, Grade Beams,	14	CY	650.00	9,100
	Concrete, Piers	0	EA	720.00	0
	Concrete, Columns	0	CY	750.00	0
	Concrete, Girders	0	CY	750.00	0
	Concrete, Foundation Mat	0	CY	550.00	0
	Concrete, Pilasters	0	CY	750.00	0
	Concrete, Shear Walls	8	CY	625.00	5,000
	Shotcrete, Walls	0	SF	13.83	0
	Structural, Steel	23,709	#	3.10	73,498
*	Architectural, Demolition & Refinish	1	LS	9,782.79	9,783
	Subtotal				97,381
	6. Longitudinal Shear Frame:				
	Concrete, Grade Beams,	14	CY	650.00	9,100
	Concrete, Piers	0	EA	720.00	0
	Concrete, Columns	0	CY	750.00	0
	Concrete, Girders	0	CY	750.00	0
	Concrete, Foundation Mat	0	CY	550.00	0
	Concrete, Pilasters	0	CY	750.00	0
	Concrete, Shear Walls	8	CY	625.00	4,938
	Shotcrete, Walls	0	SF	13.83	0
	Structural, Steel	19,478	#	3.10	60,382
*	Architectural, Demolition & Refinish	1	LS	8,455.56	8,456
	Subtotal				82,875
	Structural Costs		$$/SF of Bldg	$15.81	$275,598
*	Architectural Costs		$$/SF of Bldg	$4.35	$75,827
	Total Costs		$$/SF of Bldg	$20.16	$351,425

U R M Seismic Study

LEE SAYLOR INC. 04-Dec-86

Building 3 LEVEL 2 LSI # 9523 M

Scenario 14

SF 17,429

	Description	QTY.	Unit	Unit Price	Total
	0. Seismic Separation Cut:				
	Structural	0	LF	52.00	0
*	Architectural	0	LF	41.00	0
	Note: Added walls incl. in sections. 5 & 6				
	Subtotal				$0
	1. Anchorage, Shear Bolts, Chords & Collectors:				
	Structural	1,428	LF	45.47	64,931
*	Architectural, Demolition & Replace Finish	1,428	LF	7.10	10,139
	Subtotal				75,070
	2. Parapet Bracing:				
	Structural	204	LF	23.60	4,814
	3. Out Of Plane Bracing:				
	Structural	0	LF	19.22	0
*	Architectural - Demolition & Refinish	0	LF	6.50	0
	Subtotal				0
	4. Diaphragm:				
	Structural, Plywood, Roofs	2,600	SF	2.03	5,265
	Structural, Plywood, Floors	13,000	SF	2.60	33,800
	Structural, 2" x 16 GA straps	1,908	LF	2.50	4,770
	Structural, Steel Truss	0	#	3.25	0
*	Architectural, Demo, etc.				
	Floor	13,000	SF	3.00	39,000
	Roof	2,600	SF	3.25	8,450
	Subtotal				91,285
	5. Transverse Shear Frame:				
	Concrete, Grade Beams,	46	CY	650.00	29,900
	Concrete, Piers	0	EA	720.00	0
	Concrete, Columns	0	CY	750.00	0
	Concrete, Girders	0	CY	750.00	0
	Concrete, Foundation Mat	0	CY	550.00	0
	Concrete, Pilasters	0	CY	750.00	0
	Concrete, Shear Walls	66	CY	625.00	41,250
	Shotcrete, Walls	0	SF	13.83	0
	Structural, Steel	18,144	#	3.10	56,246
*	Architectural, Demolition & Refinish	1	LS	19,824.14	19,824
	Subtotal				147,221
	6. Longitudinal Shear Frame:				
	Concrete, Grade Beams,	0	CY	650.00	0
	Concrete, Piers	0	EA	720.00	0
	Concrete, Columns	0	CY	750.00	0
	Concrete, Girders	0	CY	750.00	0
	Concrete, Foundation Mat	0	CY	550.00	0
	Concrete, Pilasters	0	CY	750.00	0
	Concrete, Shear Walls	0	CY	625.00	0
	Shotcrete, Walls	2,622	SF	13.83	36,262
	Structural, Steel	0	#	3.10	0
*	Architectural, Demolition & Refinish	1	LS	9,065.57	9,066
	Subtotal				45,328
	Structural Costs		$$/SF of Bldg	$15.91	$277,239
*	Architectural Costs		$$/SF of Bldg	$4.96	$86,479
	Total Costs		$$/SF of Bldg	$20.87	$363,718

U R M Seismic Study

LEE SAYLOR INC. 04-Dec-86

Building 4 LEVEL 2 LSI # 9523 M

Scenario 15

SF 17,230

Description	QTY.	Unit	Unit Price	Total
0. Seismic Separation Cut:				
Structural	0	LF	52.00	0
* Architectural	0	LF	41.00	0
Note: Added walls incl. in sections. 5 & 6				
Subtotal				$0
1. Anchorage, Shear Bolts, Chords & Collectors:				
Structural	1,028	LF	45.47	46,743
* Architectural, Demolition & Replace Finish	1,028	LF	7.10	7,299
Subtotal				54,042
2. Parapet Bracing:				
Structural	0	LF	23.60	0
3. Out Of Plane Bracing:				
Structural	0	LF	19.22	0
* Architectural - Demolition & Refinish	0	LF	6.50	0
Subtotal				0
4. Diaphragm:				
Structural, Plywood, Roofs	2,650	SF	2.03	5,366
Structural, Plywood, Floors	9,173	SF	2.60	23,850
Structural, 2" x 16 GA straps	538	LF	2.50	1,345
Structural, Steel Truss	6,195	#	3.25	20,134
* Architectural, Demo, etc.				
Floor	9,173	SF	3.00	27,519
Roof	2,650	SF	3.25	8,613
Subtotal				86,826
5. Transverse Shear Frame:				
Concrete, Grade Beams,	15	CY	650.00	9,750
Concrete, Piers	0	EA	720.00	0
Concrete, Columns	0	CY	750.00	0
Concrete, Girders	0	CY	750.00	0
Concrete, Foundation Mat	0	CY	550.00	0
Concrete, Pilasters	0	CY	750.00	0
Concrete, Shear Walls	0	CY	625.00	0
Shotcrete, Walls	578	SF	13.83	7,994
Structural, Steel	12,384	#	3.10	38,390
* Architectural, Demolition & Refinish	1	LS	7,104.98	7,105
Subtotal				63,239
6. Longitudinal Shear Frame:				
Concrete, Grade Beams,	15	CY	650.00	9,750
Concrete, Piers	0	EA	720.00	0
Concrete, Columns	0	CY	750.00	0
Concrete, Girders	0	CY	750.00	0
Concrete, Foundation Mat	0	CY	550.00	0
Concrete, Pilasters	0	CY	750.00	0
Concrete, Shear Walls	0	CY	625.00	0
Shotcrete, Walls	630	SF	13.83	8,713
Structural, Steel	12,800	#	3.10	39,680
* Architectural, Demolition & Refinish	1	LS	7,413.73	7,414
Subtotal				65,557
Structural Costs	$$/SF of Bldg		$12.29	$211,715
* Architectural Costs	$$/SF of Bldg		$3.36	$57,949
Total Costs	$$/SF of Bldg		$15.65	$269,664

U R M Seismic Study

LEE SAYLOR INC. 04-Dec-86
Building 5 LEVEL 2 LS1 # 9523 M
Scenario 16
SF 48,542

Description	QTY.	Unit	Unit Price	Total
0. Seismic Separation Cut:				
Structural	830	LF	52.00	43,160
* Architectural	415	LF	41.00	17,015
Note: Added walls incl. in sections. 5 & 6				
Subtotal				$60,175
1. Anchorage, Shear Bolts, Chords & Collectors:				
Structural	2,920	LF	45.47	132,772
* Architectural, Demolition & Replace Finish	2,920	LF	7.10	20,732
Subtotal				153,504
2. Parapet Bracing:				
Structural	540	LF	23.60	12,744
3. Out Of Plane Bracing:				
Structural	0	LF	19.22	0
* Architectural - Demolition & Refinish	0	LF	6.50	0
Subtotal				0
4. Diaphragm:				
Structural, Plywood, Roofs	7,735	SF	2.03	15,663
Structural, Plywood, Floors	15,470	SF	2.60	40,222
Structural, 2" x 16 GA straps	2,000	LF	2.50	5,000
Structural, Steel Truss	0	#	3.25	0
* Architectural, Demo, etc.				
Floor	15,470	SF	3.00	46,410
Roof	7,735	SF	3.25	25,139
Subtotal				132,434

Description	QTY.	Unit	Unit Price	Total
5. Transverse Shear Frame:				
Concrete, Grade Beams,	43	CY	650.00	27,950
Concrete, Piers	0	EA	720.00	0
Concrete, Columns	0	CY	750.00	0
Concrete, Girders	0	CY	750.00	0
Concrete, Foundation Mat	0	CY	550.00	0
Concrete, Pilasters	0	CY	750.00	0
Concrete, Shear Walls	303	CY	625.00	189,375
Shotcrete, Walls	0	SF	13.83	0
Structural, Steel	0	#	3.10	0
* Architectural, Demolition & Refinish	1	LS	50,977.25	50,977
Subtotal				268,302
6. Longitudinal Shear Frame:				
Concrete, Grade Beams,	43	CY	650.00	27,950
Concrete, Piers	0	EA	720.00	0
Concrete, Columns	0	CY	750.00	0
Concrete, Girders	0	CY	750.00	0
Concrete, Foundation Mat	0	CY	550.00	0
Concrete, Pilasters	0	CY	750.00	0
Concrete, Shear Walls	303	CY	625.00	189,375
Shotcrete, Walls	0	SF	13.83	0
Structural, Steel	0	#	3.10	0
* Architectural, Demolition & Refinish	1	LS	50,977.25	50,977
Subtotal				268,302
Structural Costs		$$/SF of Bldg	$14.10	$684,212
* Architectural Costs		$$/SF of Bldg	$4.35	$211,250
Total Costs		$$/SF of Bldg	$18.45	$895,462

JOHN ROBERTSON ESTIMATE

12/ 8/86

URM SEISMIC COST STUDY SUMMARY

for
University of California

LEVEL	1		1		1		1	
BLDG.	1		1		2		2	
SCENARIO	1		2		5		6	
SF	15,634		15,634		15,405		15,405	
Category	$$/SF	$$	$$/SF	$$	$$/SF	$$	$$/SF	$$
0. Seismic Cut	.00	0	.00	0	.00	0	.00	0
1. Anchorage, Shear Bolts, etc.	3.05	47,644	3.05	47,644	5.50	84,762	5.50	84,762
2. Parapet Bracing	2.20	34,400	2.20	34,400	1.97	30,400	1.97	30,400
3. Out of Plane	.58	9,116	.58	9,116	.52	8,056	.52	8,056
4. Diaphragms	3.95	61,762	3.95	61,762	1.70	26,112	1.70	26,112
5. Transverse Shear Walls	1.94	30,374	2.94	46,020	4.15	63,868	5.60	86,275
6. Longitudinal Shear Walls	.00	0	.00	0	.00	0	.00	0
TOTALS	12.14	$189,821	13.17	$205,943	14.37	$221,405	15.87	$244,405

1		1		2		2		2	
3		3		1		2		2	
11		12		3		7		8	
17,429		17,429		15,634		15,405		15,405	
$$/SF	$$	$$/SF	$$	$$/SF	$$	$$/SF	$$	$$/SF	$$
.00	0	.00	0	.00	0	.00	0	.00	0
5.67	98,889	5.67	98,889	3.05	47,644	5.50	84,762	5.50	84,762
1.17	20,400	1.17	20,400	2.20	34,400	1.97	30,400	1.97	30,400
.00	0	.00	0	.58	9,116	.52	8,056	.52	8,056
4.31	75,144	4.31	75,144	4.22	66,026	1.70	26,112	1.70	26,112
3.79	66,126	5.39	93,884	8.99	140,530	6.76	104,201	12.49	192,457
3.32	57,873	1.61	28,144	.00	0	1.09	16,800	.00	0
18.93	$329,903	18.79	$327,526	19.71	$308,181	18.21	$280,529	23.00	$354,270

2 3 13 17,429		2 3 14 17,429		2 4 15 17,429		2 5 16 48,542		3 2 10 15,405	
$$/SF	$$	$$/SF	$$	$$/SF	$$	$$/SF	$$	$$/SF	$$
.00	0	.00	0	.00	0	1.55	75,397	.00	0
5.67	98,889	5.67	98,889	4.08	71,189	4.17	202,210	5.50	84,762
1.17	20,400	1.17	20,400	.00	0	1.11	54,000	1.97	30,400
.00	0	.00	0	.00	0	.00	0	.00	0
4.31	75,144	4.31	75,144	4.17	72,695	2.42	117,384	3.72	57,361
4.69	81,695	8.28	144,346	3.09	53,886	6.86	333,132	11.54	177,719
3.99	69,594	2.70	47,063	3.18	55,474	6.58	319,286	12.80	197,170
20.55	$358,129	22.92	$399,401	15.03	$262,007	22.69	$1,101,409	36.79	$566,701

U R M Seismic Study

04-Dec-86

Building 1 LEVEL 1
Scenario 1
SF 15,634

	Description	QTY.	Unit	Unit Price	Total
	0. Seismic Separation Cut:				
	Structural	0	LF	65.84	0
*	Architectural	0	LF	50.00	0
	Note: Added walls incl. in sections. 5 & 6				
	Subtotal				$0
	1. Anchorage, Shear Bolts, Chords & Collectors:				
	Structural	688	LF	55.00	37,840
*	Architectural, Demolition & Replace Finish	688	LF	14.25	9,804
	Subtotal				47,644
	2. Parapet Bracing:				
	Structural	344	LF	100.00	34,400
	3. Out Of Plane Bracing:				
	Structural	344	LF	20.00	6,880
*	Architectural - Demolition & Refinish	344	LF	6.50	2,236
	Subtotal				9,116
	4. Diaphragm:				
	Structural, Plywood, Roofs	7,060	SF	2.10	14,826
	Structural, Plywood, Floors	0	SF	2.10	0
	Structural, 2" x 16 GA straps	220	LF	3.00	660
	Structural, Steel Truss	6,300	#	2.00	12,600
*	Architectural, Demo, etc.				
	Floor	0	SF	2.00	0
	Roof	7,060	SF	4.10	33,676
	Subtotal				61,762

	Description	QTY.	Unit	Unit Price	Total
	5. Transverse Shear Frame:				
	Concrete, Grade Beams,	21	CY	500.00	10,500
	Concrete, Piers	3	EA	720.00	2,160
	Concrete, Columns	0	CY	650.00	0
	Concrete, Girders	0	CY	700.00	0
	Concrete, Foundation Mat	0	CY	550.00	0
	Concrete, Pilasters	0	CY	400.00	0
	Concrete, Shear Walls	0	CY	650.00	0
	Shotcrete, Walls	0	SF	12.04	0
	Structural, Steel	5,321	#	2.00	10,642
*	Architectural, Demolition & Refinish	1	LS	7,071.58	7,072
	Subtotal				30,374
	6. Longitudinal Shear Frame:				
	Concrete, Grade Beams,	0	CY	500.00	0
	Concrete, Piers	0	EA	720.00	0
	Concrete, Columns	0	CY	650.00	0
	Concrete, Girders	0	CY	700.00	0
	Concrete, Foundation Mat	0	CY	550.00	0
	Concrete, Pilasters	0	CY	400.00	0
	Concrete, Shear Walls	0	CY	650.00	0
	Shotcrete, Walls	0	SF	12.04	0
	Structural, Steel	0	#	2.00	0
*	Architectural, Demolition & Refinish	0	LS	0.00	0
	Subtotal				0

	Structural Costs		$$/SF of Bldg	$8.35	$130,508
*	Architectural Costs		$$/SF of Bldg	$3.38	$52,788
	Total Costs	105%S + 100%A	$$/SF of Bldg	$12.14	$189,821

U R M Seismic Study

04-Dec-86

Building 1 LEVEL 1
Scenario 2
SF 15,634

Description	QTY.	Unit	Unit Price	Total
0. Seismic Separation Cut:				
Structural	0	LF	65.84	0
* Architectural	0	LF	50.00	0
Note: Added walls incl. in sections. 5 & 6				
Subtotal				$0
1. Anchorage, Shear Bolts, Chords & Collectors:				
Structural	688	LF	55.00	37,840
* Architectural, Demolition & Replace Finish	688	LF	14.25	9,804
Subtotal				47,644
2. Parapet Bracing:				
Structural	344	LF	100.00	34,400
3. Out Of Plane Bracing:				
Structural	344	LF	20.00	6,880
* Architectural - Demolition & Refinish	344	LF	6.50	2,236
Subtotal				9,116
4. Diaphragm:				
Structural, Plywood, Roofs	7,060	SF	2.10	14,826
Structural, Plywood, Floors	0	SF	2.10	0
Structural, 2" x 16 GA straps	220	LF	3.00	660
Structural, Steel Truss	6,300	#	2.00	12,600
* Architectural, Demo, etc.				
Floor	0	SF	2.00	0
Roof	7,060	SF	4.10	33,676
Subtotal				61,762
5. Transverse Shear Frame:				
Concrete, Grade Beams,	18	CY	500.00	9,000
Concrete, Piers	6	EA	720.00	4,320
Concrete, Columns	30	CY	650.00	19,500
Concrete, Girders	0	CY	700.00	0
Concrete, Foundation Mat	0	CY	550.00	0
Concrete, Pilasters	0	CY	400.00	0
Concrete, Shear Walls	0	CY	650.00	0
Shotcrete, Walls	0	SF	12.04	0
Structural, Steel	0	#	2.00	0
* Architectural, Demolition & Refinish	1	LS	13,199.56	13,200
Subtotal				46,020
6. Longitudinal Shear Frame:				
Concrete, Grade Beams,	0	CY	500.00	0
Concrete, Piers	0	EA	720.00	0
Concrete, Columns	0	CY	650.00	0
Concrete, Girders	0	CY	700.00	0
Concrete, Foundation Mat	0	CY	550.00	0
Concrete, Pilasters	0	CY	400.00	0
Concrete, Shear Walls	0	CY	650.00	0
Shotcrete, Walls	0	SF	12.04	0
Structural, Steel	0	#	2.00	0
* Architectural, Demolition & Refinish	0	LS	0.00	0
Subtotal				0

Structural Costs		$$/SF of Bldg	$8.96	$140,026
* Architectural Costs		$$/SF of Bldg	$3.77	$58,916
Total Costs	105%S + 100%A	$$/SF of Bldg	$13.17	$205,943

U R M   Seismic Study

04-Dec-86

Building 1   LEVEL 2
Scenario 3
SF 15,634

Description	QTY.	Unit	Unit Price	Total
0. Seismic Separation Cut:				
Structural	0	LF	65.84	0
* Architectural	0	LF	50.00	0
Note: Added walls incl. in sections. 5 & 6				
Subtotal				$0
1. Anchorage, Shear Bolts, Chords & Collectors:				
Structural	688	LF	55.00	37,840
* Architectural, Demolition & Replace Finish	688	LF	14.25	9,804
Subtotal				47,644
2. Parapet Bracing:				
Structural	344	LF	100.00	34,400
3. Out Of Plane Bracing:				
Structural	344	LF	20.00	6,880
* Architectural - Demolition & Refinish	344	LF	6.50	2,236
Subtotal				9,116
4. Diaphragm:				
Structural, Plywood, Roofs	7,060	SF	2.10	14,826
Structural, Plywood, Floors	1,040	SF	2.10	2,184
Structural, 2" x 16 GA straps	220	LF	3.00	660
Structural, Steel Truss	6,300	#	2.00	12,600
* Architectural, Demo, etc.				
Floor	1,040	SF	2.00	2,080
Roof	7,060	SF	4.10	33,676
Subtotal				66,026
5. Transverse Shear Frame:				
Concrete, Grade Beams,	0	CY	500.00	0
Concrete, Piers	3	EA	720.00	2,160
Concrete, Columns	0	CY	650.00	0
Concrete, Girders	0	CY	700.00	0
Concrete, Foundation Mat	30	CY	550.00	16,500
Concrete, Pilasters	28	CY	400.00	11,040
Concrete, Shear Walls	0	CY	650.00	0
Shotcrete, Walls	0	SF	12.04	0
Structural, Steel	35,099	#	2.00	70,198
* Architectural, Demolition & Refinish	1	LS	40,632.09	40,632
Subtotal				140,530
6. Longitudinal Shear Frame:				
Concrete, Grade Beams,	0	CY	500.00	0
Concrete, Piers	0	EA	720.00	0
Concrete, Columns	0	CY	650.00	0
Concrete, Girders	0	CY	700.00	0
Concrete, Foundation Mat	0	CY	550.00	0
Concrete, Pilasters	0	CY	400.00	0
Concrete, Shear Walls	0	CY	650.00	0
Shotcrete, Walls	0	SF	12.04	0
Structural, Steel	0	#	2.00	0
* Architectural, Demolition & Refinish	0	LS	0.00	0
Subtotal				0
Structural Costs	$$/SF of Bldg		$13.39	$209,288
* Architectural Costs	$$/SF of Bldg		$5.66	$88,428
Total Costs 105%S + 100%A	$$/SF of Bldg		$19.71	$308,181

U R M Seismic Study

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Building 2 LEVEL 1 LSI # 9523 M

Scenario 5

SF 15,405

	Description	QTY.	Unit	Unit Price	Total
	0. Seismic Separation Cut:				
	Structural	0	LF	65.84	0
*	Architectural	0	LF	50.00	0
	Note: Added walls incl. in sections. 5 & 6				
	Subtotal				$0
	1. Anchorage, Shear Bolts, Chords & Collectors:				
	Structural	1,224	LF	55.00	67,320
*	Architectural, Demolition & Replace Finish	1,224	LF	14.25	17,442
	Subtotal				84,762
	2. Parapet Bracing:				
	Structural	304	LF	100.00	30,400
	3. Out Of Plane Bracing:				
	Structural	304	LF	20.00	6,080
*	Architectural - Demolition & Refinish	304	LF	6.50	1,976
	Subtotal				8,056
	4. Diaphragm:				
	Structural, Plywood, Roofs	1,275	SF	2.10	2,678
	Structural, Plywood, Floors	3,825	SF	2.10	8,033
	Structural, 2" x 16 GA straps	534	LF	3.00	1,602
	Structural, Steel Truss	0	#	2.00	0
*	Architectural, Demo, etc.				
	Floor	3,825	SF	2.00	7,650
	Roof	1,500	SF	4.10	6,150
	Subtotal				26,112
	5. Transverse Shear Frame:				
	Concrete, Grade Beams,	24	CY	500.00	12,000
	Concrete, Piers	0	EA	720.00	0
	Concrete, Columns	0	CY	650.00	0
	Concrete, Girders	0	CY	700.00	0
	Concrete, Foundation Mat	0	CY	550.00	0
	Concrete, Pilasters	0	CY	400.00	0
	Concrete, Shear Walls	0	CY	650.00	0
	Shotcrete, Walls	0	SF	12.04	0
	Structural, Steel	18,009	#	2.00	36,018
*	Architectural, Demolition & Refinish	1	LS	15,850.36	15,850
	Subtotal				63,868
	6. Longitudinal Shear Frame:				
	Concrete, Grade Beams,	0	CY	500.00	0
	Concrete, Piers	0	EA	720.00	0
	Concrete, Columns	0	CY	650.00	0
	Concrete, Girders	0	CY	700.00	0
	Concrete, Foundation Mat	0	CY	550.00	0
	Concrete, Pilasters	0	CY	400.00	0
	Concrete, Shear Walls	0	CY	650.00	0
	Shotcrete, Walls	0	SF	12.04	0
	Structural, Steel	0	#	2.00	0
*	Architectural, Demolition & Refinish	0	LS	0.00	0
	Subtotal				0

	Structural Costs	$$/SF of Bldg	$10.65	$164,130
*	Architectural Costs	$$/SF of Bldg	$3.19	$49,068
	Total Costs 105%S + 100%A	$$/SF of Bldg	$14.37	$221,405

U R M Seismic Study

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Building 2 LEVEL 1
Scenario 6
SF 15,405

Description	QTY.	Unit	Unit Price	Total
0. Seismic Separation Cut:				
Structural	0	LF	65.84	0
* Architectural	0	LF	50.00	0
Note: Added walls incl. in sections. 5 & 6				
Subtotal				$0
1. Anchorage, Shear Bolts, Chords & Collectors:				
Structural	1,224	LF	55.00	67,320
* Architectural, Demolition & Replace Finish	1,224	LF	14.25	17,442
Subtotal				84,762
2. Parapet Bracing:				
Structural	304	LF	100.00	30,400
3. Out Of Plane Bracing:				
Structural	304	LF	20.00	6,080
* Architectural - Demolition & Refinish	304	LF	6.50	1,976
Subtotal				8,056
4. Diaphragm:				
Structural, Plywood, Roofs	1,275	SF	2.10	2,678
Structural, Plywood, Floors	3,825	SF	2.10	8,033
Structural, 2" x 16 GA straps	534	LF	3.00	1,602
Structural, Steel Truss	0	#	2.00	0
* Architectural, Demo, etc.				
Floor	3,825	SF	2.00	7,650
Roof	1,500	SF	4.10	6,150
Subtotal				26,112
5. Transverse Shear Frame:				
Concrete, Grade Beams,	37	CY	500.00	18,500
Concrete, Piers	0	EA	720.00	0
Concrete, Columns	0	CY	650.00	0
Concrete, Girders	0	CY	700.00	0
Concrete, Foundation Mat	0	CY	550.00	0
Concrete, Pilasters	0	CY	400.00	0
Concrete, Shear Walls	60	CY	650.00	39,000
Shotcrete, Walls	0	SF	12.04	0
Structural, Steel	1,200	#	2.00	2,400
* Architectural, Demolition & Refinish	1	LS	26,374.71	26,375
Subtotal				86,275
6. Longitudinal Shear Frame:				
Concrete, Grade Beams,	0	CY	500.00	0
Concrete, Piers	0	EA	720.00	0
Concrete, Columns	0	CY	650.00	0
Concrete, Girders	0	CY	700.00	0
Concrete, Foundation Mat	0	CY	550.00	0
Concrete, Pilasters	0	CY	400.00	0
Concrete, Shear Walls	0	CY	650.00	0
Shotcrete, Walls	0	SF	12.04	0
Structural, Steel	0	#	2.00	0
* Architectural, Demolition & Refinish	0	LS	0.00	0
Subtotal				0
Structural Costs		$$/SF of Bldg	$11.43	$176,012
* Architectural Costs		$$/SF of Bldg	$3.87	$59,593
Total Costs 105%S + 100%A		$$/SF of Bldg	$15.87	$244,405

U R M Seismic Study

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Building 2 LEVEL 2

Scenario 7

SF 15,405

Description	QTY.	Unit	Unit Price	Total
0. Seismic Separation Cut:				
Structural	0	LF	65.84	0
* Architectural	0	LF	50.00	0
Note: Added walls incl. in sections. 5 & 6				
Subtotal				$0
1. Anchorage, Shear Bolts, Chords & Collectors:				
Structural	1,224	LF	55.00	67,320
* Architectural, Demolition & Replace Finish	1,224	LF	14.25	17,442
Subtotal				84,762
2. Parapet Bracing:				
Structural	304	LF	100.00	30,400
3. Out Of Plane Bracing:				
Structural	304	LF	20.00	6,080
* Architectural - Demolition & Refinish	304	LF	6.50	1,976
Subtotal				8,056
4. Diaphragm:				
Structural, Plywood, Roofs	1,275	SF	2.10	2,678
Structural, Plywood, Floors	3,825	SF	2.10	8,033
Structural, 2" x 16 GA straps	534	LF	3.00	1,602
Structural, Steel Truss	0	#	2.00	0
* Architectural, Demo, etc.				
Floor	3,825	SF	2.00	7,650
Roof	1,500	SF	4.10	6,150
Subtotal				26,112
5. Transverse Shear Frame:				
Concrete, Grade Beams,	24	CY	500.00	12,000
Concrete, Piers	0	EA	720.00	0
Concrete, Columns	0	CY	650.00	0
Concrete, Girders	0	CY	700.00	0
Concrete, Foundation Mat	0	CY	550.00	0
Concrete, Pilasters	25	CY	400.00	10,000
Concrete, Shear Walls	0	CY	650.00	0
Shotcrete, Walls	0	SF	12.04	0
Structural, Steel	27,288	#	2.00	54,576
* Architectural, Demolition & Refinish	1	LS	27,625.03	27,625
Subtotal				104.201
6. Longitudinal Shear Frame:				
Concrete, Grade Beams,	0	CY	500.00	0
Concrete, Piers	0	EA	720.00	0
Concrete, Columns	0	CY	650.00	0
Concrete, Girders	0	CY	700.00	0
Concrete, Foundation Mat	0	CY	550.00	0
Concrete, Pilasters	0	CY	400.00	0
Concrete, Shear Walls	0	CY	650.00	0
Shotcrete, Walls	936	SF	12.04	11,269
Structural, Steel	0	#	2.00	0
* Architectural, Demolition & Refinish	1	LS	5,531.04	5,531
Subtotal				16,800

Structural Costs	$$/SF of Bldg	$13.24	$203,957
* Architectural Costs	$$/SF of Bldg	$4.31	$66,374
Total Costs 105%S + 100%A	$$/SF of Bldg	$18.21	$280,529

U R M Seismic Study

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Building 2 LEVEL 2
Scenario 8
SF 15,405

Description	QTY.	Unit	Unit Price	Total
0. Seismic Separation Cut:				
Structural	0	LF	65.84	0
* Architectural	0	LF	50.00	0
Note: Added walls incl. in sections. 5 & 6				
Subtotal				$0
1. Anchorage, Shear Bolts, Chords & Collectors:				
Structural	1,224	LF	55.00	67,320
* Architectural, Demolition & Replace Finish	1,224	LF	14.25	17,442
Subtotal				84,762
2. Parapet Bracing:				
Structural	304	LF	100.00	30,400
3. Out Of Plane Bracing:				
Structural	304	LF	20.00	6,080
* Architectural - Demolition & Refinish	304	LF	6.50	1,976
Subtotal				8,056
4. Diaphragm:				
Structural, Plywood, Roofs	1,275	SF	2.10	2,678
Structural, Plywood, Floors	3,825	SF	2.10	8,033
Structural, 2" x 16 GA straps	534	LF	3.00	1,602
Structural, Steel Truss	0	#	2.00	0
* Architectural, Demo, etc.				
Floor	3,825	SF	2.00	7,650
Roof	1,500	SF	4.10	6,150
Subtotal				26,112
5. Transverse Shear Frame:				
Concrete, Grade Beams,	37	CY	500.00	18,500
Concrete, Piers	0	EA	720.00	0
Concrete, Columns	93	CY	650.00	60,450
Concrete, Girders	78	CY	700.00	54,600
Concrete, Foundation Mat	0	CY	550.00	0
Concrete, Pilasters	0	CY	400.00	0
Concrete, Shear Walls	0	CY	650.00	0
Shotcrete, Walls	0	SF	12.04	0
Structural, Steel	0	#	2.00	0
* Architectural, Demolition & Refinish	1	LS	58,906.89	58,907
Subtotal				192,457
6. Longitudinal Shear Frame:				
Concrete, Grade Beams,	0	CY	500.00	0
Concrete, Piers	0	EA	720.00	0
Concrete, Columns	0	CY	650.00	0
Concrete, Girders	0	CY	700.00	0
Concrete, Foundation Mat	0	CY	550.00	0
Concrete, Pilasters	0	CY	400.00	0
Concrete, Shear Walls	0	CY	650.00	0
Shotcrete, Walls	0	SF	12.04	0
Structural, Steel	0	#	2.00	0
* Architectural, Demolition & Refinish	0	LS	0.00	0
Subtotal				0
Structural Costs		$$/SF of Bldg	$16.21	$249,662
* Architectural Costs		$$/SF of Bldg	$5.98	$92,125
Total Costs 105%S + 100%A		$$/SF of Bldg	$23.00	$354,270

U R M Seismic Study

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Building 2 LEVEL 3
Scenario 10
SF 15,405

Description	QTY.	Unit	Unit Price	Total
0. Seismic Separation Cut:				
Structural	0	LF	65.84	0
* Architectural	0	LF	50.00	0
Note: Added walls incl. in sections. 5 & 6				
Subtotal				$0
1. Anchorage, Shear Bolts, Chords & Collectors:				
Structural	1,224	LF	55.00	67,320
* Architectural, Demolition & Replace Finish	1,224	LF	14.25	17,442
Subtotal				84,762
2. Parapet Bracing:				
Structural	304	LF	100.00	30,400
3. Out Of Plane Bracing:				
Structural	0	LF	20.00	0
* Architectural - Demolition & Refinish	0	LF	6.50	0
Subtotal				0
4. Diaphragm:				
Structural, Plywood, Roofs	1,275	SF	2.10	2,678
Structural, Plywood, Floors	3,825	SF	2.10	8,033
Structural, 2" x 16 GA straps	534	LF	3.00	1,602
Structural, Steel Truss	11,360	#	2.00	22,720
* Architectural, Demo, etc.				
Floor	3,825	SF	2.00	7,650
Roof	1,500	SF	4.10	14,679
Subtotal				57,361

5. Transverse Shear Frame:				
Concrete, Grade Beams,	37	CY	500.00	18,500
Concrete, Piers	0	EA	720.00	0
Concrete, Columns	0	CY	650.00	0
Concrete, Girders	0	CY	700.00	0
Concrete, Foundation Mat	0	CY	550.00	0
Concrete, Pilasters	0	CY	400.00	0
Concrete, Shear Walls	0	CY	650.00	0
Shotcrete, Walls	8,280	SF	12.04	99,691
Structural, Steel	0	#	2.00	0
* Architectural, Demolition & Refinish	1	LS	59,527.58	59,528
Subtotal				177,719
6. Longitudinal Shear Frame:				
Concrete, Grade Beams,	26	CY	500.00	13,000
Concrete, Piers	0	EA	720.00	0
Concrete, Columns	0	CY	650.00	0
Concrete, Girders	0	CY	700.00	0
Concrete, Foundation Mat	0	CY	550.00	0
Concrete, Pilasters	0	CY	400.00	0
Concrete, Shear Walls	0	CY	650.00	0
Shotcrete, Walls	10,120	SF	12.04	121,845
Structural, Steel	0	#	2.00	0
* Architectural, Demolition & Refinish	1	LS	62,324.73	62,325
Subtotal				197,170

Structural Costs	$$/SF of Bldg	$25.04	$385,788
* Architectural Costs	$$/SF of Bldg	$10.49	$161,623
Total Costs 105%S + 100%A	$$/SF of Bldg	$36.79	$566,701

U R M Seismic Study

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Building 3 LEVEL 1

Scenario 11

SF 17,429

Description	QTY.	Unit	Unit Price	Total
0. Seismic Separation Cut:				
Structural	0	LF	65.84	0
* Architectural	0	LF	50.00	0
Note: Added walls incl. in sections. 5 & 6				
Subtotal				$0
1. Anchorage, Shear Bolts, Chords & Collectors:				
Structural	1,428	LF	55.00	78,540
* Architectural, Demolition & Replace Finish	1,428	LF	14.25	20,349
Subtotal				98,889
2. Parapet Bracing:				
Structural	204	LF	100.00	20,400
3. Out Of Plane Bracing:				
Structural	0	LF	20.00	0
* Architectural - Demolition & Refinish	0	LF	6.50	0
Subtotal				0
4. Diaphragm:				
Structural, Plywood, Roofs	2,600	SF	2.10	5,460
Structural, Plywood, Floors	13,000	SF	2.10	27,300
Structural, 2" x 16 GA straps	1,908	LF	3.00	5,724
Structural, Steel Truss	0	#	2.00	0
* Architectural, Demo, etc.				
Floor	13,000	SF	2.00	26,000
Roof	2,600	SF	4.10	10,660
Subtotal				75,144

Description	QTY.	Unit	Unit Price	Total
5. Transverse Shear Frame:				
Concrete, Grade Beams,	14	CY	500.00	7,000
Concrete, Piers	0	EA	720.00	0
Concrete, Columns	0	CY	650.00	0
Concrete, Girders	0	CY	700.00	0
Concrete, Foundation Mat	0	CY	550.00	0
Concrete, Pilasters	0	CY	400.00	0
Concrete, Shear Walls	0	CY	650.00	0
Shotcrete, Walls	0	SF	12.04	0
Structural, Steel	21,000	#	2.00	42,000
* Architectural, Demolition & Refinish	1	LS	17,125.50	17,126
Subtotal				66,126
6. Longitudinal Shear Frame:				
Concrete, Grade Beams,	14	CY	500.00	7,000
Concrete, Piers	0	EA	720.00	0
Concrete, Columns	0	CY	650.00	0
Concrete, Girders	0	CY	700.00	0
Concrete, Foundation Mat	0	CY	550.00	0
Concrete, Pilasters	0	CY	400.00	0
Concrete, Shear Walls	0	CY	650.00	0
Shotcrete, Walls	0	SF	12.04	0
Structural, Steel	18,000	#	2.00	36,000
* Architectural, Demolition & Refinish	1	LS	14,873.10	14,873
Subtotal				57,873
Structural Costs	$$/SF of Bldg		$13.16	$229,424
* Architectural Costs	$$/SF of Bldg		$5.11	$89,008
Total Costs 105%S + 100%A	$$/SF of Bldg		$18.93	$329,903

U R M   Seismic Study

04-Dec-86

Building 3   LEVEL 1
Scenario 12
SF 17,429

Description	QTY.	Unit	Unit Price	Total
0. Seismic Separation Cut:				
Structural	0	LF	65.84	0
* Architectural	0	LF	50.00	0
Note: Added walls incl. in sections. 5 & 6				
Subtotal				$0
1. Anchorage, Shear Bolts, Chords & Collectors:				
Structural	1,428	LF	55.00	78,540
* Architectural, Demolition & Replace Finish	1,428	LF	14.25	20,349
Subtotal				98,889
2. Parapet Bracing:				
Structural	204	LF	100.00	20,400
3. Out Of Plane Bracing:				
Structural	0	LF	20.00	0
* Architectural - Demolition & Refinish	0	LF	6.50	0
Subtotal				0
4. Diaphragm:				
Structural, Plywood, Roofs	2,600	SF	2.10	5,460
Structural, Plywood, Floors	13,000	SF	2.10	27,300
Structural, 2" x 16 GA straps	1,908	LF	3.00	5,724
Structural, Steel Truss	0	#	2.00	0
* Architectural, Demo, etc.				
Floor	13,000	SF	2.00	26,000
Roof	2,600	SF	4.10	10,660
Subtotal				75,144
5. Transverse Shear Frame:				
Concrete, Grade Beams,	14	CY	500.00	7,000
Concrete, Piers	3	EA	720.00	2,160
Concrete, Columns	0	CY	650.00	0
Concrete, Girders	0	CY	700.00	0
Concrete, Foundation Mat	0	CY	550.00	0
Concrete, Pilasters	0	CY	400.00	0
Concrete, Shear Walls	46	CY	650.00	29,900
Shotcrete, Walls	0	SF	12.04	0
Structural, Steel	12,960	#	2.00	25,920
* Architectural, Demolition & Refinish	1	LS	28,904.49	28,904
Subtotal				93,884
6. Longitudinal Shear Frame:				
Concrete, Grade Beams,	0	CY	500.00	0
Concrete, Piers	0	EA	720.00	0
Concrete, Columns	0	CY	650.00	0
Concrete, Girders	0	CY	700.00	0
Concrete, Foundation Mat	0	CY	550.00	0
Concrete, Pilasters	0	CY	400.00	0
Concrete, Shear Walls	0	CY	650.00	0
Shotcrete, Walls	1,568	SF	12.04	18,879
Structural, Steel	0	#	2.00	0
* Architectural, Demolition & Refinish	1	LS	9,265.68	9,266
Subtotal				28,144

Structural Costs		$$/SF of Bldg	$12.70	$221,283
* Architectural Costs		$$/SF of Bldg	$5.46	$95,179
Total Costs	105%S + 100%A	$$/SF of Bldg	$18.79	$327,526

U R M Seismic Study

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Building 3 LEVEL 2
Scenario 13
SF 17,429

Description	QTY.	Unit	Unit Price	Total
0. Seismic Separation Cut:				
Structural	0	LF	65.84	0
* Architectural	0	LF	50.00	0
Note: Added walls incl. in sections. 5 & 6				
Subtotal				$0
1. Anchorage, Shear Bolts, Chords & Collectors:				
Structural	1,428	LF	55.00	78,540
* Architectural, Demolition & Replace Finish	1,428	LF	14.25	20,349
Subtotal				98,889
2. Parapet Bracing:				
Structural	204	LF	100.00	20,400
3. Out Of Plane Bracing:				
Structural	0	LF	20.00	0
* Architectural - Demolition & Refinish	0	LF	6.50	0
Subtotal				0
4. Diaphragm:				
Structural, Plywood, Roofs	2,600	SF	2.10	5,460
Structural, Plywood, Floors	13,000	SF	2.10	27,300
Structural, 2" x 16 GA straps	1,908	LF	3.00	5,724
Structural, Steel Truss	0	#	2.00	0
* Architectural, Demo, etc.				
Floor	13,000	SF	2.00	26,000
Roof	2,600	SF	4.10	10,660
Subtotal				75,144

Description	QTY.	Unit	Unit Price	Total
5. Transverse Shear Frame:				
Concrete, Grade Beams,	14	CY	500.00	7,000
Concrete, Piers	0	EA	720.00	0
Concrete, Columns	0	CY	650.00	0
Concrete, Girders	0	CY	700.00	0
Concrete, Foundation Mat	0	CY	550.00	0
Concrete, Pilasters	0	CY	400.00	0
Concrete, Shear Walls	8	CY	650.00	5,200
Shotcrete, Walls	0	SF	12.04	0
Structural, Steel	23,709	#	2.00	47,418
* Architectural, Demolition & Refinish	1	LS	22,077.14	22,077
Subtotal				81,695
6. Longitudinal Shear Frame:				
Concrete, Grade Beams,	14	CY	500.00	7,000
Concrete, Piers	0	EA	720.00	0
Concrete, Columns	0	CY	650.00	0
Concrete, Girders	0	CY	700.00	0
Concrete, Foundation Mat	0	CY	550.00	0
Concrete, Pilasters	0	CY	400.00	0
Concrete, Shear Walls	8	CY	650.00	5,135
Shotcrete, Walls	0	SF	12.04	0
Structural, Steel	19,478	#	2.00	38,956
* Architectural, Demolition & Refinish	1	LS	18,503.04	18,503
Subtotal				69,594
Structural Costs	$$/SF of Bldg		$14.24	$248,133
* Architectural Costs	$$/SF of Bldg		$5.60	$97,589
Total Costs 105%S + 100%A	$$/SF of Bldg		$20.55	$358,129

U R M Seismic Study

04-Dec-86

Building 3 LEVEL 2
Scenario 14
SF 17,429

	Description	QTY.	Unit	Unit Price	Total
	0. Seismic Separation Cut:				
	Structural	0	LF	65.84	0
*	Architectural	0	LF	50.00	0
	Note: Added walls incl. in sections. 5 & 6				
	Subtotal				$0
	1. Anchorage, Shear Bolts, Chords & Collectors:				
	Structural	1,428	LF	55.00	78,540
*	Architectural, Demolition & Replace Finish	1,428	LF	14.25	20,349
	Subtotal				98,889
	2. Parapet Bracing:				
	Structural	204	LF	100.00	20,400
	3. Out Of Plane Bracing:				
	Structural	0	LF	20.00	0
*	Architectural - Demolition & Refinish	0	LF	6.50	0
	Subtotal				0
	4. Diaphragm:				
	Structural, Plywood, Roofs	2,600	SF	2.10	5,460
	Structural, Plywood, Floors	13,000	SF	2.10	27,300
	Structural, 2" x 16 GA straps	1,908	LF	3.00	5,724
	Structural, Steel Truss	0	#	2.00	0
*	Architectural, Demo, etc.				
	Floor	13,000	SF	2.00	26,000
	Roof	2,600	SF	4.10	10,660
	Subtotal				75,144
	5. Transverse Shear Frame:				
	Concrete, Grade Beams,	46	CY	500.00	23,000
	Concrete, Piers	0	EA	720.00	0
	Concrete, Columns	0	CY	650.00	0
	Concrete, Girders	0	CY	700.00	0
	Concrete, Foundation Mat	0	CY	550.00	0
	Concrete, Pilasters	0	CY	400.00	0
	Concrete, Shear Walls	66	CY	650.00	42,900
	Shotcrete, Walls	0	SF	12.04	0
	Structural, Steel	18,144	#	2.00	36,288
*	Architectural, Demolition & Refinish	1	LS	42,158.01	42,158
	Subtotal				144,346
	6. Longitudinal Shear Frame:				
	Concrete, Grade Beams,	0	CY	500.00	0
	Concrete, Piers	0	EA	720.00	0
	Concrete, Columns	0	CY	650.00	0
	Concrete, Girders	0	CY	700.00	0
	Concrete, Foundation Mat	0	CY	550.00	0
	Concrete, Pilasters	0	CY	400.00	0
	Concrete, Shear Walls	0	CY	650.00	0
	Shotcrete, Walls	2,622	SF	12.04	31,569
	Structural, Steel	0	#	2.00	0
*	Architectural, Demolition & Refinish	1	LS	15,494.01	15,494
	Subtotal				47,063
	Structural Costs	$$/SF of Bldg		$15.56	$271,181
*	Architectural Costs	$$/SF of Bldg		$6.58	$114,661
	Total Costs 105%S + 100%A	$$/SF of Bldg		$22.92	$399,401

U R M Seismic Study

04-Dec-86

Building 4 LEVEL 2
Scenario 15
SF 17,230

Description	QTY.	Unit	Unit Price	Total
0. Seismic Separation Cut:				
Structural	0	LF	65.84	0
* Architectural	0	LF	50.00	0
Note: Added walls incl. in sections. 5 & 6				
Subtotal				$0
1. Anchorage, Shear Bolts, Chords & Collectors:				
Structural	1,028	LF	55.00	56,540
* Architectural, Demolition & Replace Finish	1,028	LF	14.25	14,649
Subtotal				71,189
2. Parapet Bracing:				
Structural	0	LF	100.00	0
3. Out Of Plane Bracing:				
Structural	0	LF	20.00	0
* Architectural - Demolition & Refinish	0	LF	6.50	0
Subtotal				0
4. Diaphragm:				
Structural, Plywood, Roofs	2,650	SF	2.10	5,565
Structural, Plywood, Floors	9,173	SF	2.10	19,263
Structural, 2" x 16 GA straps	538	LF	3.00	1,614
Structural, Steel Truss	6,195	#	2.00	12,390
* Architectural, Demo, etc.				
Floor	9,173	SF	2.00	18,346
Roof	2,650	SF	4.10	15,516
Subtotal				72,695

Description	QTY.	Unit	Unit Price	Total
5. Transverse Shear Frame:				
Concrete, Grade Beams,	15	CY	500.00	7,500
Concrete, Piers	0	EA	720.00	0
Concrete, Columns	0	CY	650.00	0
Concrete, Girders	0	CY	700.00	0
Concrete, Foundation Mat	0	CY	550.00	0
Concrete, Pilasters	0	CY	400.00	0
Concrete, Shear Walls	0	CY	650.00	0
Shotcrete, Walls	578	SF	12.04	6,959
Structural, Steel	12,384	#	2.00	24,768
* Architectural, Demolition & Refinish	1	LS	14,658.42	14,658
Subtotal				53,886
6. Longitudinal Shear Frame:				
Concrete, Grade Beams,	15	CY	500.00	7,500
Concrete, Piers	0	EA	720.00	0
Concrete, Columns	0	CY	650.00	0
Concrete, Girders	0	CY	700.00	0
Concrete, Foundation Mat	0	CY	550.00	0
Concrete, Pilasters	0	CY	400.00	0
Concrete, Shear Walls	0	CY	650.00	0
Shotcrete, Walls	630	SF	12.04	7,585
Structural, Steel	12,800	#	2.00	25,600
* Architectural, Demolition & Refinish	1	LS	14,788.81	14,789
Subtotal				55,474
Structural Costs		$$/SF of Bldg	$10.17	$175,285
* Architectural Costs		$$/SF of Bldg	$4.52	$77,958
Total Costs 105%S + 100%A		$$/SF of Bldg	$15.21	$262,007

U R M Seismic Study

04-Dec-86

Building 5 LEVEL 2
Scenario 16
SF 48,542

Description	QTY.	Unit	Unit Price	Total
0. Seismic Separation Cut:				
Structural	830	LF	65.84	54,647
* Architectural	415	LF	50.00	20,750
Note: Added walls incl. in sections. 5 & 6				
Subtotal				$75,397
1. Anchorage, Shear Bolts, Chords & Collectors:				
Structural	2,920	LF	55.00	160,600
* Architectural, Demolition & Replace Finish	2,920	LF	14.25	41,610
Subtotal				202,210
2. Parapet Bracing:				
Structural	540	LF	100.00	54,000
3. Out Of Plane Bracing:				
Structural	0	LF	20.00	0
* Architectural - Demolition & Refinish	0	LF	6.50	0
Subtotal				0
4. Diaphragm:				
Structural, Plywood, Roofs	7,735	SF	2.10	16,244
Structural, Plywood, Floors	15,470	SF	2.10	32,487
Structural, 2" x 16 GA straps	2,000	LF	3.00	6,000
Structural, Steel Truss	0	#	2.00	0
* Architectural, Demo, etc.		-		
Floor	15,470	SF	2.00	30,940
Roof	7,735	SF	4.10	31,714
Subtotal				117,384

Description	QTY.	Unit	Unit Price	Total
5. Transverse Shear Frame:				
Concrete, Grade Beams,	43	CY	500.00	21,500
Concrete, Piers	0	EA	720.00	0
Concrete, Columns	0	CY	650.00	0
Concrete, Girders	0	CY	700.00	0
Concrete, Foundation Mat	0	CY	550.00	0
Concrete, Pilasters	0	CY	400.00	0
Concrete, Shear Walls	303	CY	650.00	196,950
Shotcrete, Walls	0	SF	12.04	0
Structural, Steel	0	#	2.00	0
* Architectural, Demolition & Refinish	1	LS	114682	114,682
Subtotal				333,132
6. Longitudinal Shear Frame:				
Concrete, Grade Beams,	43	CY	500.00	21,500
Concrete, Piers	0	EA	720.00	0
Concrete, Columns	0	CY	650.00	0
Concrete, Girders	0	CY	700.00	0
Concrete, Foundation Mat	0	CY	550.00	0
Concrete, Pilasters	0	CY	400.00	0
Concrete, Shear Walls	303	CY	650.00	196,950
Shotcrete, Walls	0	SF	12.04	0
Structural, Steel	0	#	2.00	0
* Architectural, Demolition & Refinish	1	LS	100836	100,836
Subtotal				319,286

Structural Costs		$$/SF of Bldg	$15.67	$760,878
* Architectural Costs		$$/SF of Bldg	$7.02	$340,532
Total Costs	105%S + 100%A	$$/SF of Bldg	$23.47	$1,139,453

Appendix 2

EARTHQUAKE HAZARDS AND HOUSING

APPENDIX 2

FINANCIAL DATA ON RESIDENTIAL BUILDINGS

MARCH 1987

Sponsored by:	Center for Environmental Change, Inc. 1721 63rd Street Berkeley, California 94703
With funding from:	City and County of San Francisco Department of City Planning
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INTRODUCTION

This appendix provides documentation for the income, expense, and debt service assumptions used in the economic prototypes that were introduced in Chapter II. Representing seven typical unreinforced masonry buildings, these prototypes can be used to assess the financial impact that varying levels seismic upgrading will have upon the owners and tenants of URM buildings.

Section I of this appendix describes the methodology used to develop the prototypes, summarizes the principal factors influencing building cash flow, and presents financial pro formas for the seven examples. These financial statements show the building owner's annual return using a range of debt service assumptions. The cash flow figures are then compared to seismic upgrade cost estimates. Furthermore, allowable per unit rent increases are computed for each upgrade option.

The assumptions used to create the pro formas are documented in Sections II through VI. Section II describes building height and size in the San Francisco neighborhoods that have a large concentration of URM buildings. Residential and commercial rent data is included in Section III. Section IV describes operating expenses on both a line-item and a per-unit basis. Section V discusses debt service characteristics and includes information regarding building valuation, length of ownership, and mortgage terms. Finally, Section VI displays summary cash flow statements for actual buildings located in the Tenderloin, in Chinatown, and along the Bush Street corridor. These statements provide the basis for both the prototypes and the tables that are included in this appendix.

I. PRO FORMAS FOR PROTOTYPICAL UNREINFORCED MASONRY BUILDINGS

The financial pro formas that were introduced in Chapter II are duplicated in this section of the appendix. As in Chapter II, this section discusses methodology used to develop the prototypes, indicates projected before and after tax return, shows the cash flow impact of three seismic upgrade alternatives, and describes the effect that seismic upgrading will have upon residential rents. Also included in this section is a summary of the principal factors affecting building cash flow.

METHODOLOGY USED TO DEVELOP PROTOTYPES

In order to evaluate the potential effects of a seismic upgrading ordinance, one must understand the economic circumstances of the affected buildings. Because this financial information is of a confidential nature, our research design faced limitations. A comprehensive building-by-building survey would have been extremely expensive, and would have encountered significant resistance by owners to revealing personal financial information. A research design based on random sampling, was rejected for this reason as well. In addition, since there is wide variation in such building characteristics as rental history, neighborhood, ownership form, and debt service, it would have been necessary to select an extremely large total sample in order to achieve statistical significance for each subgroup of buildings. Nor was it possible to simply select and analyze a single representative building of each major physical type. Although the buildings in our study can usefully be categorized into a few physical types, their financial circumstances are much more diverse. Field research consistently reveals that so far as real estate finance is concerned, "every building is different."

For these reasons we chose to develop prototypes representing typical URM residential structures. The economic prototypes are similar to those analyzed in the engineering portion of this study. However, the economic prototypes do not exist as actual individual buildings. Their financial pro formas are carefully blended hypotheticals, constructed from data collected on nearly 100 buildings owned by private individuals, management companies, family associations, and nonprofit corporations.

To build the financial prototypes, the study team first reviewed the physical characteristics and known ownership patterns of URM residential structures in the study neighborhoods. Based upon this review we selected seven categories representing the most common URM structures. Although the majority of buildings are privately owned, we have included two examples of nonprofit-owned buildings since their income and expense characteristics differ substantially from buildings under private ownership.

We developed financial pro formas for these prototypical buildings using data obtained from a variety of sources. These included: income and expense statements for specific buildings that owners and property managers provided, petitions filed with the San Francisco Residential Rent Stabilization Board, detailed sales listings provided by real estate brokers, and information published in the San Francisco Board of Realtors' Multiple Listings Service. In addition, we used information from City Assessor's records and data analyzed in City Planning Department documents and in studies conducted by neighborhood organizations.

We supplemented this data by interviewing building owners, property managers, real estate brokers, lenders, community leaders, housing officials, and others who are familiar with the ownership and operating characteristics of residential buildings in the study neighborhoods. Using a variety of information sources, our intention was to neutralize any bias that may have influenced the pro formas had we restricted our analysis to more limited data. We believe that the prototypes realistically represent the financial circumstances of URM residential buildings in San Francisco, particularly in the focused study areas.

STRUCTURE OF THE FINANCIAL PROTOTYPES

The seven prototypes are described in the following pages. Each is represented by a pro forma, an accounting of the revenues, expenses, and investment characteristics of the building. The basic elements of each pro forma are:

1. Revenues are calculated based on the number and type of rental units, the neighborhood, and the amount of commercial space. Although the commercial income figures are based on current market rates, residential rents represent average rents for occupied units and therefore reflect turnover rates typical for each neighborhood.

2. From each building's total potential income a vacancy/collection loss factor is deducted in order to produce a figure representing effective gross (or actual) income (EGI).

3. Operating expenses, including maintenance, utilities, taxes, insurance, and management, are then subtracted to yield the net operating income (NOI). Because property taxes increase substantially when buildings are reassessed upon sale, our operating expense figures differ for each purchase scenario.

4. Debt service typically constitutes a large fraction of total costs, dramatically affects building profitability, and will affect the owner's ability to absorb the expense of seismic upgrading. Unlike rental income and operating expenses, debt service is more a function of the building's history than of current market factors. The current annual debt service will depend upon the building value, the percentage that is financed, and the loan terms. In order to provide financial pictures that reflect a variety of scenarios ranging from long-term ownership to recent acquisition, we have calculated the annual debt service that would be currently payable if the building were last financed in 1971, 1976, 1981, and 1986. Using interest rates, loan terms, and sale prices for comparable buildings in the study neighborhoods in those years, we

calculate a range of values that reflects the possible debt service load on these buildings today. To simplify our analysis we assume that the buildings have not been refinanced. However, it is likely that a number of buildings owned for a long time have been refinanced. In that case, the current debt service will be higher than that shown in the prototypes. The method we used to develop our sales price and mortgage assumptions is explained in Section V.

5. We subtract the debt service values from the net operating income to produce the building's before tax cash flow (BTCF) for each financing option.

6. To develop after tax cash flow figures, we first calculate the taxable income that each prototype generates by subtracting interest and depreciation from the NOI. We calculate the 1986 deductions using the mortgage terms and depreciation methods that were in effect during the four hypothetical purchase years. Because the 1981 mortgages are adjustable rate loans, we use current interest rates to calculate the interest deduction for the 1981 purchase scenarios. When allowable, we have used accelerated depreciation, switching to straight-line when appropriate to maximize the deduction.

7. Finally, we show the investor's after tax cash flow (ATCF) using three tax rates to reflect a range of owner income levels. In order to simplify the analysis we make several assumptions. First, we have not examined the tax consequences of building sales, nor have we calculated multi-year return on investment measures. Rather, we restrict our analysis to an examination of a single year's cash flow. In practice, however, cash flows vary year by year, and most real estate investors calculate their return by analyzing the income generated over several years along with the gain realized from sale of the property. Many of the new federal tax provisions apply only to property placed in service after 1986. Thus, because we have chosen to assume that our prototypes remain under the same ownership, the after tax cash flows do not reflect the effect of changes in the depreciation schedule, the alternative minimum tax, at-risk rules, or the capital gains tax.

The key tax reform provisions that will affect the cash flow of the prototypes are the lowered tax brackets and the new restrictions on passive losses. Lower tax brackets will result in a higher ATFC for buildings that currently generate a positive taxable income and a lower ATCF for those that now yield a negative taxable income.

In most of the prototypes, tax losses contribute a large share of the after tax cash flows. The Tax Reform Act imposes restrictions on such tax shelters, allowing the taxpayer to deduct losses from "passive activities" only to the extent that the loss offsets passive income. By definition, the tax code considers investment in rental property to be a passive activity. Under the new law real estate investment losses may be used to offset other income only when an investor is significantly involved in property management decisions. In addition, the deduction is limited to $25,000 per year. The $25,000 allowance is phased out for income levels beginning at $100,000.

The after tax cash flows shown in our pro formas assume that the tax loss is fully deductible. After 1986, this will not always be true, but will be possible either when the loss is allocated at up to $25,000 each to actively involved owners or when building investors who are not involved in management use the loss to offset income from other rental property.

It should be noted that when the taxable income generated by the building is negative, the ATCF equals the BTCF for buildings that are owned by individuals with no other income or by nonprofits that pay no tax. People with limited incomes will make little use of the tax shelter aspect of real estate.

8. The final element of the economic prototypes is the introduction of seismic upgrading costs and the calculation of their impacts on the buildings' net cash flows. Because the cost will vary with the level of upgrading required, we examine three alternatives. Generally speaking, the minimal acceptable upgrade is a wall anchorage system which costs about $6 per square foot. Additional shear bracing for long-span ground floor commercial space adds about $5 per square foot to this figure in those buildings which have such spaces. For four-story buildings, Level 1 upgrading costs $16 per square foot and Level 2 upgrading costs $21 per square foot. For five and six-story buildings, the costs increase to $21 per square foot for Level 1 upgrading and to $25 per square foot for Level 2 work.[1] When these figures (which are fully explained in Chapter III and the Engineering Appendix) are added to the protoype pro formas, it is possible to derive net cash flow remaining after each level of prospective upgrading. To calculate debt service on upgrade loans we use the 10%, ten year terms governing rent passthroughs allowed under San Francisco's rent control ordinance. Actual finance terms may differ.

The pro forma analysis allows one to examine the impact that seismic upgrading requirements would have on building owners if subsidies are unavailable and in circumstances when rental market conditions force owners to absorb the expense. It is likely, however, that in most cases, rent increases will result. San Francisco's rent control ordinance allows the cost of building improvements to be passed on to tenants. The law provides for a ten year amortization period at 10% interest (unless a lower interest rate is obtained through federal financing programs). Under these rules, the allowable passthrough amounts to $13.22 per month for each $1000 of upgrade expense. The upgrade of these costs upon current rents is shown in tables following each pro forma.

---

[1] Level 1 upgrading is the equivalent of the Los Angeles requirements for Class II and IV, medium and low risk buildings with occupancy of less than 100 people. Level 2 is the equivalent of the Los Angeles requirements for Class II, non-essential buildings having an occupant load of 100 or more. This is the same as the maximum requirement fo the 1973 UBC which is the current San Francisco code for substantial rehabilitation.

FACTORS AFFECTING CASH FLOW

The seven prototypes represent buildings which differ with respect to location, form of ownership and building characteristics. Each of these qualities has a bearing upon building cash flow, and therefore an impact upon the extent to which seismic upgrading can be supported. Among the factors affecting cash flow are the following.

1. Building size and height - Buildings in the Tenderloin and along Bush Street are typically taller than those in Chinatown. The average number of stories is five to six in the Tenderloin compared to three or four in Chinatown. Similarly, Bush Street and Tenderloin area buildings generally have greater bulk with the typical ground floor square footage exceeding that for buildings in Chinatown. In addition to having an impact upon the cost of seismic upgrading, building height and size affect the operating budget for buildings in that taller buildings generally have elevators and larger buildings have a greater amount of common area space to maintain.

2. Residential Use - While the great majority of residential buildings along Bush Street are apartments, the housing stock in both the Tenderloin and Chinatown includes a large number of residential hotels. Because the units are smaller, residential hotel revenue per square foot is typically higher than the average per square foot rent for apartment buildings. Operating expenses also differ by building type. Because hotels often employ a larger staff, and because shared kitchens and baths require greater maintenance, hotels may have higher expenses than do apartment buildings.

3. Unit Size - The typical unit size in Chinatown is smaller than that in the other two areas. In addition, while many of the Tenderloin residential hotel units include individual or shared baths, most Chinatown hotels provide only community baths.

4. Residential rents - Due in part to the building and unit qualities just described and in part to characteristics of building ownership, financing, and residential tenure that will be discussed below, typical rents are lower in Chinatown than in the other two areas. The rent asked for vacant units is highest in the Bush Street area.

5. Commercial Use and Rent Level - The majority of buildings along Bush Street lack commercial space. In contrast, many Chinatown and Tenderloin area buildings include ground floor commercial units. Because residential units often are rented at below-market rates, the revenue collected from commercial tenants provides a significant percentage of total revenue for Chinatown property owners.

Rents charged for commercial space differ by location, with Bush Street buildings located near Union Square being able to command the highest rents. While commercial rents in the Tenderloin average a little over one dollar per square foot, Chinatown area commercial rents range from $4 to $7 per square foot for storefronts along Grant and Stockton streets.

6. Form of Ownership - The form of building ownership influences a number of factors including residential and commercial rent levels, the percentage of building value that is financed, the typical length of time property is held, and the tax situation building owners and investors face. For example, "mom and pop" building owners often retain long-term ownership and as a result, may have little or no debt service. In contrast, syndicated properties often change hands frequently. Due to appreciation in property value and higher interest rates, the owners of recently purchased buildings are likely to face substantial loan payments.

In addition, residential units in buildings owned by both family associations and nonprofit owners are often offered at below market rates. Furthermore, nonprofit organizations typically set aside replacement reserves, spend more for operations and maintenance, and often have financed their buildings with a combination of subsidies that result in lower debt service than a privately owned building would have

FINANCIAL PROTOTYPES

In this section, financial pro formas representing seven typical unreinforced masonry buildings are presented. As described above, these statements include information about building income, operating expenses, and debt service. In addition, the pro formas include a calculation of the current before and after tax cash flow for five building finance scenarios. Cash flow calculations are then provided for three seismic upgrade alternatives. Finally, we show the impact of seismic upgrading upon residential rents in each building.

BUILDING C-1

Prototype C-1 is a small Chinatown residential hotel. On the upper levels, this three-story building has fourteen rooms whose dimensions average 120 square feet and which rent for an average $160 per month. Along with the sleeping rooms, the upper floors contain communal kitchens and baths.

This building is representative of a type common in this area. The Chinatown neighborhood contains approximately 85 unreinforced masonry residential hotels.[2] One-fifth of these are located along Stockton and Grant Streets, the district's busiest commercial streets. Fifty-five percent of the area's URM residential hotels have fewer than twenty units, and sixty-five percent of URM residential buildings in this neighborhood are three stories or less in height.

Because we have placed this building on busy Stockton Street, the 1300 square feet of ground floor commercial space rent for $4 per square foot. As is common in the Chinatown neighborhood, commercial rent represents a significant portion of the building's revenue. In this case, the ground floor space contributes 71% of the total income. There are three principal reasons for this. First, many of the elderly tenants in Chinatown hotels have occupied the same unit for a long period of time. Due to the slow rate of turnover (average tenure is ten to fifteen years),

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(Footnote continued on next page.)

rents have remained low. In addition, long-time building owners often have little or no debt service and can therefore afford to provide below-market rate residential units. It is common for family and district associations (which own about 20% of the Chinatown residential hotels) to provide low cost housing for their members. Finally, because shop owners are willing to pay a premium to locate in Chinatown and on Stockton Street, the building generates substantial commercial revenue.

As is typical in the Chinatown neighborhood, the vacancy/collection loss rate is low at an average 3% of gross possible income.

If one assumes, as is common in Chinatown, that this building has been under the same ownership for many years, the debt service is low, therefore the cash flow is positive and sufficient to cover seismic upgrading. However, one must remember that many Chinatown buildings are not owned by typical real estate investors. In contrast to investment properties located elsewhere, this building may provide the owner's sole source of income. In addition, it is likely that the owner's initial equity investment was greater than for the typical income-producing property, therefore the actual rate of return may be less than the cash flow implies.[3]

At $6 per square foot, a wall anchorage upgrade for this building will cost approximately $25,000. Under this option, a $4,000 annual expense passthrough is allowed under the current rent control law.[4] This amounts to a $24 monthly rent increase per unti and represents a 15% increase over the building's current average rents.

In contrast, a Level 1 upgrade will cost nearly $67,000, and will result in a $10,800 annual passthrough. This amounts to an average per unit montly rent increase of $63, a 39% increase over current rents.

(Footnote continued from previous page.)

[2] The Chinatown "core" is the area described in the City Planning Department's Chinatown Rezoning study.

[3] According to real estate brokers familiar with Chinatown investments, downpayments amounting to 40% of the purchase price are common in the area. This compares to the 20% downpayment that is typical for most investment properties.

[4] San Francisco's rent control ordinance allows building improvements to be passed on throught rent increases. The allowable passthrough is based upon a ten year amortization period at ten percent interest (unless a lower interest rate is obtained through federal financing programs).

PROTOTYPE #	C-1
NEIGHBORHOOD	CHINATOWN
OWNERSHIP	PRIVATE
BUILDING TYPE	RESIDENTIAL HOTEL GROUND FLOOR COMMERCIAL ON STOCKTON STREET
# STORIES	3 NO ELEVATOR
TOTAL BUILDING AREA (1)	4,182 SQFT
# RES. UNITS	14 ROOMS
RESIDENTIAL RENT	$160 /ROOM/MONTH
COMMERCIAL AREA	1,300 SQFT
COMM. RENT	$4.00 SQFT/MO

(1) Building area is calculated as follows:

7 rooms per floor @ 120 square feet = 840 sf
x 1.66 circulation and common room factor = 1394 sf
x 3 floors = 4182 sf

1986 FINANCIAL PRO FORMA BY YEAR OF PURCHASE: PROTOTYPE C-1

	(1) NO MORTGAGE	1971 PURCHASE	1976 PURCHASE	1981 PURCHASE	1986 PURCHASE
1986 Gross Income - Residential	$26,880	$26,880	$26,880	$26,880	$26,880
1986 Gross Income - Commercial	$62,400	$62,400	$62,400	$62,400	$62,400
GROSS POSSIBLE INCOME	$89,280	$89,280	$89,280	$89,280	$89,280
(Less) Vacancy/Bad Debt (2)	($2,700)	($2,700)	($2,700)	($2,700)	($2,700)
EFFECTIVE GROSS INCOME	$86,580	$86,580	$86,580	$86,580	$86,580
(Less) Operating Expenses (3)	($22,846)	($22,846)	($22,846)	($22,846)	($22,846)
(Less) Real Estate Taxes (4)	($5,617)	($5,617)	($5,617)	($9,173)	($11,087)
Expenses and Taxes: Per Room	2033	2033	2033	2287	2424
Expenses and Taxes: as % of EGI	33%	33%	33%	35%	39%
NET OPERATING INCOME	$58,117	$58,117	$58,117	$54,561	$52,648
(Less) Current Debt Service (5)	0	(17,799)	(25,740)	(45,528)	(45,776)
BEFORE TAX CASH FLOW	58,117	40,319	32,377	$9,033	6,872
1986 Depreciation Deduction (6)	0	$6,430	$8,504	$39,450	$68,464
1986 Interest Deduction	0	$12,603	$21,688	$41,270	$43,176
TAXABLE INCOME	58,117	$39,084	$27,925	($26,159)	($58,992)
(Less) Tax					
15% Bracket	($8,718)	($5,863)	($4,189)	($3,924)	($8,849)
22% Bracket	($12,786)	($8,599)	($6,144)	($5,755)	($12,978)
50% Bracket	($29,059)	($19,542)	($13,963)	($13,080)	($29,496)
AFTER TAX CASH FLOW					
15% Bracket	$49,400	$34,456	$28,188	$12,957	$15,721
22% Bracket	$45,332	$31,720	$26,234	$14,788	$19,850
50% Bracket	$29,059	$20,776	$18,414	$22,113	$36,368

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(1) This column represents a building under long-term ownership with the mortgage fully repaid and all depreciation taken.
(2) Vacancy/Bad Debt Allowance is calculated at 3% of residential gross and 3% of commercial gross.
(3) Operating Expenses are calculated using the methods described in Section IV.
(4) Real Estate Taxes are 1.14% of 1986 assessed value.
(5) Debt Service is based on mortgage terms in the year of purchase as explained in Section V.
(6) Depreciation deduction reflects a switch from accelerated to straight line method for buildings purchased in 1971, 1976 and 1981 to maximize deduction.

MORTGAGE AND DEPRECIATION CALCULATION

		1971 PURCHASE	1976 PURCHASE	1981 PURCHASE	1986 PURCHASE
TOTAL PURCHASE PRICE	(1)	$321,500	$425,200	$736,000	$972,500
Maximum Loan/Value Ratio		60%	60%	60%	60%
Minimum Debt Coverage Ratio		1.15	1.15	1.15	1.15
MORTGAGE AMOUNT	(2)	$192,900	$255,100	$441,600	$444,000
% of Purchase Price		60%	60%	60%	46%
Interest Rate	(3)	8.50%	9.50%	9.75%	9.75%
Amortization Period	(4)	30 yrs	30 yrs	30 yrs	30 yrs
DEBT SERVICE		($17,799)	($25,740)	($45,528)	($45,776)
Depreciation Method	(5)	40 yrs	40 yrs	15 yrs	19 yrs
Acceleration (if applicable)		125%	125%	175%	175%
Initial Depreciable Basis	(6)	$257,200	$340,160	$588,800	$778,000

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(1) Purchase price is calculated by the method described in Section V.

(2) Mortgage amount is the lesser of a 60% loan-to-value ratio or a 1.15% debt coverage ratio. (Loan-to-value ratios in Chinatown are commonly lower than the 80% used in the other two prototype areas.)

(3) Rates for 1981 and 1986 mortgages are variable. Current debt service is calculated at 1986 rates.

(4) 1981 and 1986 mortgages are 15-year loans with a 30-year amortization schedule.

(5) Depreciation is calculated according to the method in effect in the year of purchase.

(6) Depreciable basis calculation assumes building value is 80% of total building cost.

CASH FLOW BY UPGRADE OPTION AND MORTGAGE DATE Prototype C-1

UPGRADE OPTION	NO MORTGAGE	1971 PURCHASE	1976 PURCHASE	1981 PURCHASE	1986 PURCHASE
WALL ANCHORAGE					
Cost/sf $6					
Building Size: 4,182 sf					
TOTAL COST: $25,092					
Current Debt Serice	$0	($17,799)	($25,740)	($45,528)	($45,776)
Upgrade Debt Service (1)	($3,979)	($3,979)	($3,979)	($3,979)	($3,979)
Total Debt Service	($3,979)	($21,778)	($29,719)	($49,507)	($49,755)
BEFORE TAX CASH FLOW	$54,138	$36,339	$28,398	$5,054	$2,893
AFTER TAX CASH FLOW					
15% Bracket	$45,802	$30,858	$24,590	$9,344	$12,123
22% Bracket	$41,911	$28,300	$22,813	$11,346	$16,430
50% Bracket	$26,350	$18,067	$15,705	$$19,354	$33,659
LEVEL 1					
Cost/sf $16					
Building Size: 4,182 sf					
TOTAL COST: $66,912					
Current Debt Service	$0	($17,799)	($25,740)	($45,528)	($45,776)
Upgrade Debt Service (1)	($10,611)	($10,611)	($10,611)	($10,611)	($10,611)
Total Debt Service	($10,611)	($28,410)	($36,351)	($56,139)	($56,387)
BEFORE TAX CASH FLOW	$47,506	$29,708	$21,766	($1,578)	($3,739)
AFTER TAX CASH FLOW					
15% Bracket	$39,765	$24,821	$18,553	$3,322	$6,086
22% Bracket	$36,152	$22,540	$17,054	$5,608	$10,671
50% Bracket	$21,701	$13,418	$11,056	$14,754	$29,010
LEVEL 2					
Cost/sf $21					
Building Size: 4,182 sf					
TOTAL COST: $87,822					
Current Debt Serice	$0	($17,799)	($25,740)	($45,528)	($45,776)
Upgrade Debt Service (1)	($13,927)	($13,927)	($13,927)	($13,927)	($13,927)
Total Debt Service	($13,927)	($31,726)	($39,667)	($59,455)	($59,703)
BEFORE TAX CASH FLOW	$44,190	$26,392	$18,450	($4,894)	($7,055)
AFTER TAX CASH FLOW					
15% Bracket	$36,754	$21,810	$15,542	$311	$3,075
22% Bracket	$33,283	$19,672	$14,185	$2,740	$7,802
50% Bracket	$19,401	$11,119	$8,757	$12,456	$26,711

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(1) Seismic upgrades financed with 10-year improvement loan at 10%.

BUILDING C-1

IMPACT OF SEISMIC UPGRADING ON CURRENT RENTS

UPGRADE LEVEL	COST PER SQFT	TOTAL COST	COST PER UNIT	MONTHLY RENT INCREASE PER UNIT	NEW RENT	PERCENT INCREASE OVER CURRENT RENTS
WALL ANCHORAGE	$6	$25,092	$1,792	$24	$184	15%
LEVEL 1	$16	$66,912	$4,779	$63	$223	39%
LEVEL 2	$21	$87,822	$6,273	$83	$243	52%

BUILDING C-2

Prototype C-2 represents a twelve unit, three-story Chinatown apartment building with rents averaging $235 for studios and $265 for one-bedroom apartments. These very low rents are explained by the fact that tenant turnover is even less for apartments than for Chinatown's residential hotel units.

This building represents a typical Chinatown apartment building. Sixty-five percent of Chinatown URM apartment buildings are of three stories or less and 25% have between seven and twelve units.

Because we have located this building on a side street away from the neighborhood's busy shopping streets, the ground floor commercial space, which amounts to 2150 square feet, rents for $2 per square foot. The commercial portion of this building contributes 58% of the total revenue. As in prototype C-1, the vacancy/collection loss rate is 3%.

PROTOTYPE #	C-2
NEIGHBORHOOD	CHINATOWN
OWNERSHIP	PRIVATE
BUILDING TYPE	APARTMENTS GROUND FLOOR COMMERCIAL NOT ON STOCKTON STREET
# STORIES	3 NO ELEVATOR
TOTAL BUILDING AREA (1)	6,750 SF
# RES. UNITS	4 STUDIOS 8 1-BEDROOMS
RESIDENTIAL RENT	$235 /STUDIO/MONTH $265 /1-BR /MONTH
COMMERCIAL AREA	2,150 SQFT
COMM. RENT	$2.00 SQFT/MO

(1) Building area is calculated as follows:

2 studios @ 250 sf and 4 1BR @ 300 sf = 1800 sf per floor
x 1.25 circulation and common room factor = 2250 sf per floor
x 3 floors = 6750 sf TOTAL

1986 FINANCIAL PRO FORMA BY YEAR OF PURCHASE: PROTOTYPE C-2

		(1) NO MORTGAGE	1971 PURCHASE	1976 PURCHASE	1981 PURCHASE	1986 PURCHASE
1986 Gross Income - Residential		$36,720	$36,720	$36,720	$36,720	$36,720
1986 Gross Income - Commercial		$51,600	$51,600	$51,600	$51,600	$51,600
GROSS POSSIBLE INCOME		$88,320	$88,320	$88,320	$88,320	$88,320
(Less) Vacancy/Bad Debt	(2)	($2,600)	($2,600)	($2,600)	($2,600)	($2,600)
EFFECTIVE GROSS INCOME		$85,720	$85,720	$85,720	$85,720	$85,720
(Less) Operating Expenses	(3)	($21,205)	($21,205)	($21,205)	($21,205)	($21,205)
(Less) Real Estate Taxes	(4)	($7,313)	($7,313)	($7,313)	($9,471)	($10,766)
Expenses and Taxes: Per Unit		2,376	2,376	2,376	2,556	2,664
Expenses and Taxes: as % of EGI		33%	33%	33%	36%	37%
NET OPERATING INCOME		$57,202	$57,202	$57,202	$55,044	$53,749
(Less) Current Debt Service	(5)	0	(21,886)	(33,863)	(47,003)	(46,735)
BEFORE TAX CASH FLOW		57,202	35,316	23,339	8,041	7,014
1986 Depreciation Deduction	(6)	0	$7,906	$11,188	$40,731	$66,486
1986 Interest Deduction		0	$15,498	$28,531	$42,664	$44,314
TAXABLE INCOME		57,202	$33,798	$17,483	($28,351)	($57,051)
(Less) Tax						
15% Bracket		($8,580)	($5,070)	($2,622)	$4,253	$8,558
22% Bracket		($12,584)	($7,436)	($3,846)	$6,237	$12,551
50% Bracket		($28,601)	($16,899)	($8,742)	$14,175	$28,526
AFTER TAX CASH FLOW						
15% Bracket		$48,622	$30,246	$20,717	$12,294	$15,572
22% Bracket		$44,618	$27,880	$19,493	$14,279	$19,565
50% Bracket		$28,601	$18,417	$14,598	$22,217	$35,540

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(1) This column represents a building under long-term ownership with the mortgage fully repaid and all depreciation taken.

(2) Vacancy/Bad Debt Allowance is calculated at 4% of residential gross.

(3) Operating Expenses are calculated using the methods described in Section IV.

(4) Real Estate Taxes are 1.14% of 1986 assessed value.

(5) Debt Service is calculated based on mortgage terms in the year purchased as explained in Section V.

MORTGAGE AND DEPRECIATION CALCULATION

		1971 PURCHASE	1976 PURCHASE	1981 PURCHASE	1986 PURCHASE
TOTAL PURCHASE PRICE	(1)	$395,300	$559,400	$759,900	$944,400
Maximum Loan/Value Ratio		60%	60%	60%	60%
Minimum Debt Coverage Ratio		1.15	1.15	1.15	1.15
MORTGAGE AMOUNT	(2)	$237,200	$335,600	$455,900	$453,300
% of Purchase Price		60%	60%	60%	48%
Interest Rate	(3)	8.50%	9.50%	9.75%	9.75%
Amortization Period	(4)	30 yrs	30 yrs	30 yrs	30 yrs
DEBT SERVICE		($21,886)	($33,863)	($47,003)	($46,735)
Depreciation Method	(5)	40 yrs	40 yrs	15 yrs	19 yrs
Acceleration (if applicable)		125%	125%	175%	175%
Initial Depreciable Basis	(6)	$316,240	$447,520	$607,920	$755,520

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(1) Purchase Price is calculated by the method described in Section V.

(2) Mortgage amount is calculated as the lesser of an 60% loan-to-value ratio or a 1.15% debt coverage ratio. (Loan-to-value ratios in Chinatown are commonly lower than the 80% used in the two other prototype areas.)

(3) Rates for 1981 and 1986 mortgages are variable. Current debt service is calculated at 1986 rates.

(4) 1981 and 1986 mortgages are 15-year loans with a 30-year amortization schedule.

(5) Depreciation is calculated according to the method effect in the year of purchase.

(6) Depreciable basis calculation assumes building value is 80% of total building cost.

CASH FLOW BY UPGRADE OPTION AND MORTGAGE DATE Prototype C-2

UPGRADE OPTION	NO MORTGAGE	1971 PURCHASE	1976 PURCHASE	1981 PURCHASE	1986 PURCHASE
WALL ANCHORAGE					
Cost/sf $6					
Building Size: 6,750 sf					
TOTAL COST: $40,500					
Current Debt Serice	$0	($21,886)	($33,863)	($47,003)	($46,735)
Upgrade Debt Service (1)	($6,423)	($6,423)	($6,423)	($6,423)	($6,423)
Total Debt Service	($6,423)	($28,309)	($40,285)	($53,425)	($53,157)
BEFORE TAX CASH FLOW	$50,780	$28,893	$16,917	$1,619	$592
AFTER TAX CASH FLOW					
15% Bracket	$42,790	$24,414	$14,885	$6,462	$9,740
22% Bracket	$39,062	$22,324	$13,937	$8,722	$14,009
50% Bracket	$24,148	$13,963	$10,144	$17,763	$31,086
LEVEL 1					
Cost/sf $16					
Building Size: 6,750 sf					
TOTAL COST: $108,000					
Current Debt Service	$0	($21,886)	($33,863)	($47,003)	($46,735)
Upgrade Debt Service (1)	($17,127)	($17,127)	($17,127)	($17,127)	($17,127)
Total Debt Service	($17,127)	($39,013)	($50,990)	($64,129)	($63,861)
BEFORE TAX CASH FLOW	$40,075	$18,189	$6,213	($9,085)	($10,113)
AFTER TAX CASH FLOW					
15% Bracket	$33,070	$14,695	$5,165	($3,258)	$20
22% Bracket	$29,801	$13,064	$4,676	($538)	$4,749
50% Bracket	$16,725	$6,540	$2,721	$10,341	$23,663
LEVEL 2					
Cost/sf $21					
Building Size: 6,750 sf					
TOTAL COST: $141,750					
Current Debt Serice	$0	($21,886)	($33,863)	($47,003)	($46,735)
Upgrade Debt Service (1)	($22,479)	($22,479)	($22,479)	($22,479)	($22,479)
Total Debt Service	($22,479)	($44,365)	($56,342)	($69,481)	($69,213)
BEFORE TAX CASH FLOW	$34,723	$12,837	$860	($14,437)	($15,465)
AFTER TAX CASH FLOW					
15% Bracket	$28,210	$9,835	$305	($8,117)	($4,840)
22% Bracket	$25,171	$8,434	$46	($5,168)	$119
50% Bracket	$13,014	$2,829	($990)	$6,629	$19,952

(1) This column represents a building under long-term ownership with the mortgage fully repaid and all depreciation taken.
(2) Vacancy/Bad Debt Allowance is calculated at 3% of residential gross and 3% of commercial gross.
(3) Operating Expenses are calculated using the methods described in Section IV.
(4) Real Estate Taxes are 1.14% of 1986 assessed value.
(5) Debt Service is based on mortgage terms in the year of purchase as explained in Section V.
(6) Depreciation deduction reflects a switch from accelerated to straight line method for buildings purchased in 1971, 1976, and 1981 to maximize deduction.

BUIDLING C-2

IMPACT OF SEISMIC UPGRADING ON CURRENT RENTS

UPGRADE LEVEL	COST PER SQFT	TOTAL COST	COST PER UNIT	MONTHLY RENT INCREASE PER UNIT	NEW RENT	PERCENT INCREASE OVER CURRENT RENTS
WALL ANCHORAGE	$6	$40,500	$3,375	$38	$273-303	14-16%
LEVEL 1	$16	$108,000	$9,000	$119	$354-384	45-51%
LEVEL 2	$21	$141,750	$11,813	$156	$391-421	59-66%

BUILDING C-3

Prototype C-3 is a 48 room, 4-story Chinatown residential hotel. Because we have assigned ownership of this building to a nonprofit organization, rents are below average at $140 per room and $1.50 per square foot for the ground floor commercial space. As is typical for nonprofit owners, a higher percentage of effective gross income is used to cover operating expenses.

Because nonprofits generally plan for long-term building ownership, they typically spend more for maintenance. Furthermore, nonprofits often provide additional staff and services and therefore have higher management costs. Although this building's expense/income ratio is higher than for the other two Chinatown prototypes, the expense per unit cost is lower, reflecting the economy of scale achieved in this larger building.

For our prototype, we have assumed that sixty percent of this building's purchase price has been covered by grants or deferred-interest loans. As has been common for non-profit housing developments, only forty percent of the sales price is assumed to have been financed under conventional mortgage terms. Even with these assumptions, buildings purchased recently appear to have cash shortfalls in amounts which are probably covered by government or foundation grants.

Buildings under this form of ownership will almost certainly require some additional subsidy in order to comply with a seismic upgrade ordinance. In addition, nonprofit housing organizations provide rental units at substantially reduced levels, and tenants in these buildings generally have very low incomes. Any rent increase necessitated by seismic upgrading is bound to impose a burden on them.

PROTOTYPE #	C-3
NEIGHBORHOOD	CHINATOWN
OWNERSHIP	NON-PROFIT
BUILDING TYPE	RESIDENTIAL HOTEL GROUND FLOOR COMMERCIAL NOT ON STOCKTON STREET
# STORIES	4 NO ELEVATOR
TOTAL BUILDING AREA (1)	12,750 SQFT
# RES. UNITS	48 ROOMS
RESIDENTIAL RENT	$140 /ROOM/MONTH
COMMERCIAL AREA	3,100 SQFT
COMM. RENT	$1.50 SQFT/MO

(1) Building area is calculated as follows:

16 rooms per floor @ 120 sf = 1920 sf
x 1.66 circulation and common room factor = 3187 sf
x 4 floors = 12,478 sf

1986 FINANCIAL PRO FORMA BY YEAR OF PURCHASE

	NO MORTGAGE (1)	1971 PURCHASE	1976 PURCHASE	1981 PURCHASE	1986 PURCHASE
1986 Gross Income - Residential	$80,640	$80,640	$80,640	$80,640	$80,640
1986 Gross Income - Commercial	$55,800	$55,800	$55,800	$55,800	$55,800
GROSS POSSIBLE INCOME	$136,440	$136,440	$136,440	$136,440	$136,440
(Less) Vacancy/Bad Debt (2)	($4,100)	($4,100)	($4,100)	($4,100)	($4,100)
EFFECTIVE GROSS INCOME	$132,340	$132,340	$132,340	$132,340	$132,340
(Less) Operating Expenses (3)	($59,455)	($59,455)	($59,455)	($59,455)	($59,455)
(Less) Real Estate Taxes (4)	($9,943)	($9,943)	($9,943)	($19,262)	($23,783)
Expenses and Taxes: Per Unit	1446	1446	1446	1640	1734
Expenses and Taxes: as % of EGI	52%	52%	52%	59%	63%
NET OPERATING INCOME	$62,942	$62,942	$62,942	$53,623	$49,102
(Less) Current Debt Service (5)	0	(20,513)	(30,695)	(46,631)	(42,693)
BEFORE TAX CASH FLOW	62,942	42,429	32,248	6,992	6,409
1986 Depreciation Deduction (6)	0	$11,116	$15,212	$86,548	$221,972
1986 Interest Deduction	0	$14,525	$25,862	$42,327	$40,268
TAXABLE INCOME (7)	62,942	$37,301	$21,868	($75,252)	($213,137)
(Less) Tax					
15% Bracket	($9,441)	($5,595)	($3,280)	$11,288	$31,971
22% Bracket	($13,847)	($8,206)	($4,811)	$16,555	$46,890
50% Bracket	($31,471)	($18,651)	($10,934)	$37,626	$106,569
AFTER TAX CASH FLOW					
15% Bracket	$53,501	$36,834	$28,967	$18,280	$38,380
22% Bracket	$49,095	$34,223	$27,437	$23,547	$53,299
50% Bracket	$31,471	$23,778	$21,314	$44,618	$112,978

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(1) This column represents a building under long-term ownership with the mortgage fully repaid and all depreciation taken.
(2) Vacancy/Bad Debt Allowance is calculated at 4% of residential gross.
(3) Operating Expenses are calculated using the methods described in Section IV.
(4) Real Estate Taxes are 1.14% of 1986 assessed value.
(5) Debt Service is calculated based on mortgage terms in the year purchased as explained in Section V.
(6) Depreciation deduction reflects a switch from accelerated to straight line method for buildings purchased in 1971 and 1976 to maximize deduction.
(7) Tax deductions are shown to demonstrate tax benefits passed through to limited partners if property is syndicated.

MORTGAGE AND DEPRECIATION CALCULATION

	1971 PURCHASE	1976 PURCHASE	1981 PURCHASE	1986 PURCHASE
TOTAL PURCHASE PRICE (1)	$555,800	$760,600	$1,545,500	$2,086,200
Maximum Loan/Value Ratio	40%	40%	20%	20%
Minimum Debt Coverage Ratio	1.15	1.15	1.15	1.15
MORTGAGE AMOUNT (2)	$222,320	$304,200	$309,100	$414,100
Actual Loan/Value	40%	40%	20%	20%
Interest Rate (3)	8.50%	9.50%	9.75%	9.75%
DEBT SERVICE	($20,513)	($30,695)	($31,868)	($42,693)
Amortization Period (4)	30 yrs	30 yrs	30 yrs	30
Depreciation Method (5)	40 yrs	40 yrs	15 yrs	19
Acceleration (if applicable)	125%	125%	175%	175%yrs
Initial Depreciable Basis (6)	$444,640	$608,480	$1,236,400	$1,668,960 yrs

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(1) Purchase price is calculated by method described in Section V.

(2) Mortgage amount is 40% of purchase price in 1971 and 1976 and 20% of purchase price in 1981 and 1986.

(3) Rates for 1981 and 1986 mortgages are variable. Current debt service is calculated at 1986 rates.

(4) 1981 and 1986 motgages are 15-year loans with a 30-year amortization schedule.

(5) Depreciation is calculated according to the method effect in the year of purchase.

(6) Depreciable basis calculation assumes building value is 80% of total building cost.

CASH FLOW BY UPGRADE OPTION AND MORTGAGE DATE   Prototype C-3

UPGRADE OPTION	NO MORTGAGE	1971 PURCHASE	1976 PURCHASE	1981 PURCHASE	1986 PURCHASE
WALL ANCHORAGE					
Cost/sf $6					
Building Size: 12,750 sf					
TOTAL COST: $76,500					
Current Debt Serice	$0	($20,513)	($30,695)	($31,868)	($42,693)
Upgrade Debt Service (1)	($12,131)	($12,131)	($12,131)	($12,131)	($12,131)
Total Debt Service	($12,131)	($32,645)	($42,826)	($43,999)	($54,825)
BEFORE TAX CASH FLOW	$50,811	$30,297	$20,116	$9,624	($5,722)
AFTER TAX CASH FLOW					
15% Bracket	$42,493	$25,825	$17,959	$22,035	$27,372
22% Bracket	$38,611	$23,738	$16,953	$27,827	$42,815
50% Bracket	$23,084	$15,391	$12,926	$50,994	$104,590
LEVEL 1					
Cost/sf $16					
Building Size: 12,750 sf					
TOTAL COST: $204,000					
Current Debt Service	$0	($20,513)	($30,695)	($31,868)	($42,693)
Upgrade Debt Service (1)	($32,351)	($32,351)	($32,351)	($32,351)	($32,351)
Total Debt Service	($32,351)	($52,864)	($63,045)	($64,218)	($75,044)
BEFORE TAX CASH FLOW	$30,592	$10,078	($103)	($10,595)	($25,941)
AFTER TAX CASH FLOW					
15% Bracket	$24,126	$7,459	($408)	$3,668	$9,005
22% Bracket	$21,109	$6,236	($550)	$10,325	$25,313
50% Bracket	$9,039	$1,346	($1,118)	$36,949	$90,546
LEVEL 2					
Cost/sf $21					
Building Size: 12,750 sf					
TOTAL COST: $267,750					
Current Debt Serice	$0	($20,513)	($30,695)	($31,868)	($42,693)
Upgrade Debt Service (1)	($42,460)	($42,460)	($42,460)	($42,460)	($42,460)
Total Debt Service	($42,460)	($62,973)	($73,155)	($74,328)	($85,153)
BEFORE TAX CASH FLOW	$20,482	($31)	($10,212)	($20,705)	($36,051)
AFTER TAX CASH FLOW					
15% Bracket	$14,946	($1,721)	($9,587)	($5,511)	($175)
22% Bracket	$12,363	($2,510)	($9,295)	$1,579	$16,567
50% Bracket	$2,029	($5,664)	($8,128)	$29,939	$83,536

(1) Seismic upgrades financed with 10-year improvement loan at 10%.

BUILDINGS C-3

IMPACT OF SEISMIC UPGRADING ON CURRENT RENTS

UPGRADE LEVEL	COST PER SQFT	TOTAL COST	COST PER UNIT	MONTHLY RENT INCREASE PER UNIT	NEW RENT	PERCENT INCREASE OVER CURRENT RENTS
WALL ANCHORAGE	$6	$76,500	$1,594	$21	$161	15%
LEVEL 1	$16	$204,000	$4,250	$56	$196	40%
LEVEL 2	$21	$267,750	$5,578	$74	$214	53%

BUILDING T-1

Prototype T-1 represents a 100 room, five-story Tenderloin residential hotel. In comparison to those in Chinatown, rooms in hotels in the Tenderloin neighborhood are typically larger, and many have private or shared baths. In addition, ground floor lobbies are common in Tenderloin hotels, whereas in Chinatown, ground floor space is more often exclusively devoted to commercial use.

Residential rents are higher in this neighborhood, in part because the rate of turnover is substantially higher. (San Francisco's rent control ordinance does not limit rent increases when units become vacant.) For this prototype, monthly rent averages $285 per unit. The 3500 square feet of ground floor commercial space rent for $1 per square foot. Due to higher turnover in this neighborhood, the vacancy/loss factor is six percent.

Representing one of the 85 URM residential hotels in the core Tenderloin census tracts, this building is of a type common in this neighborhood. Forty-four percent of the URM residential buildings in the neighborhood are five or more stories. For these buildings, the cost of Level 1 upgrading is $5 greater per square foot than for four-story or shorter buildings. Level 2 upgrading for a five-story building costs an additional $4 per square foot.

With a healthy positive cash flow, this building appears to be a profitable investment under all five finance options we have examined.[5] A wall anchorage upgrade for this building would cost a total of $176,400, resulting in an allowable monthly rent increase of $23 per unit, an increase of 8% over current average rents. In comparison, a Level 1 upgrade would result in 29% rent increases equalling $82 per unit per month. It should be noted, however, that those tenants who have recently moved into units in this building are likely to be paying rent at levels $50 to $75 above the average rent used for this prototype. For recently occupied units, the rent increases necessitated by seismic upgrading may push the asking price above the market-rate rent for comparable units.

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[5] As it yields a 10% cap rate, the 1986 sale price that results from our projection model may be an underestimation.

PROTOTYPE #	T-1
NEIGHBORHOOD	TENDERLOIN
OWNERSHIP	PRIVATE
BUILDING TYPE	RESIDENTIAL HOTEL GROUND FLOOR COMMERCIAL
# STORIES	5 WITH ELEVATOR
TOTAL BUILDING AREA (1)	29,400 SQFT
# RES. UNITS	100 ROOMS
RESIDENTIAL RENT	$285 /RM/MO
COMMERCIAL AREA	3,500 SQFT
COMM. RENT	$1.00 SQFT/MO

(1) Building area calculated as follows:

25 rooms per floor @ 168 sf = 4200 sf per floor
x 1.4 circulation/common room factor = 5880 sf per floor
x 5 floors = 29400 sf TOTAL

1986 FINANCIAL PRO FORMA BY YEAR OF PURCHASE: PROTOTYPE T-1

	(1) NO MORTGAGE	1971 PURCHASE	1976 PURCHASE	1981 PURCHASE	1986 PURCHASE
1986 Gross Income - Residential	$342,000	$342,000	$342,000	$342,000	$342,000
1986 Gross Income - Commercial	$42,000	$42,000	$42,000	$42,000	$42,000
GROSS POSSIBLE INCOME	$384,000	$384,000	$384,000	$384,000	$384,000
(Less) Vacancy/Bad Debt (2)	($31,560)	($31,560)	($31,560)	($31,560)	($31,560)
EFFECTIVE GROSS INCOME	$352,440	$352,440	$352,440	$352,440	$352,440
(Less) Operating Expenses (3)	($129,642)	($129,642)	($129,642)	($129,642)	($129,642)
(Less) Real Estate Taxes (4)	($8,834)	($8,834)	($8,834)	($17,065)	($22,727)
Expenses and Taxes: Per Unit	1385	1385	1385	1467	1524
Expenses and Taxes: as % of EGI	39%	39%	39%	42%	43%
NET OPERATING INCOME	$213,964	$213,964	$213,964	$205,734	$200,071
(Less) Current Debt Service (5)	0	(38,783)	(51,824)	(112,930)	(164,430)
BEFORE TAX CASH FLOW	213,964	175,182	162,141	92,804	35,642
1986 Depreciation Deduction (6)	0	$10,508	$12,840	$73,389	$140,349
1986 Interest Deduction	0	$27,463	$43,665	$102,507	$155,005
TAXABLE INCOME	213,964	$175,993	$157,459	$29,838	($95,283)
(Less) Tax					
15% Bracket	($32,095)	($26,399)	($23,619)	($4,476)	$14,292
22% Bracket	($47,072)	($38,719)	($34,641)	($6,564)	$20,962
50% Bracket	($106,982)	($87,997)	($78,730)	($14,919)	$47,642
AFTER TAX CASH FLOW					
15% Bracket	$181,870	$148,783	$138,522	$88,328	$49,934
22% Bracket	$166,892	$136,463	$127,500	$86,240	$56,604
50% Bracket	$106,982	$87,185	$83,411	$77,885	$83,283

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(1) This column represents a building under long-term ownership with the mortgage fully repaid and all depreciation taken.

(2) Vacancy/Bad Debt Allowance is calculated at 8% of residential gross (higher than normal due to size of building) and 10% of commercial gross.

(3) Operating Expenses are calculated using the methods described in Section IV.

(4) Real Estate Taxes are 1.14% of 1986 assessed value.

(5) Debt Service is calculated based on mortgage terms in the year purchased as explained in Section V.

(6) Depreciation deduction reflects a switch from accelerated to straight line method for buildings purchased in 1971, 1976, and 1981 to maximize deduction.

MORTGAGE AND DEPRECIATION CALCULATION

		1971 PURCHASE	1976 PURCHASE	1981 PURCHASE	1986 PURCHASE
TOTAL PURCHASE PRICE	(1)	525,400	642,000	1,369,200	1,993,600
Maximum Loan/Value Ratio		80%	80%	80%	80%
Minimum Debt Coverage Ratio		1.15	1.15	1.15	1.15
MORTGAGE AMOUNT	(2)	$420,320	$513,600	$1,095,360	$1,594,880
Actual Debt Coverage		80%	80%	80%	80%
Interest Rate	(3)	8.50%	9.50%	9.75%	9.75%
Amortization Period	(4)	30 yrs	30 yrs	30 yrs	30 yrs
DEBT SERVICE		($38,783)	($51,824)	($112,930)	($164,430)
Depreciation Method	(5)	40 yrs 125%	40 yrs 125%	15 yrs 175%	19 yrs 175%
Initial Depreciable Basis	(6)	$420,320	$513,600	$1,095,360	$1,594,880

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(1) Purchase price is calculated by the method described in Section V.

(2) Mortgage amount is calculated as the lesser of an 80% loan-to-value ratio or a 1.15% debt coverage ratio.

(3) Rates for 1981 and 1986 mortgages are variable. Current debt service is calculated at 1986 rates.

(4) 1981 and 1986 motgages are 15-year loans with a 30-year amortization schedule.

(5) Depreciation is calculated according to the method effect in the year of purchase.

(6) Depreciable basis calculation assumes building value is 80% of total building cost.

CASH FLOW BY UPGRADE OPTION AND MORTGAGE DATE   Prototype T-1

UPGRADE OPTION	NO MORTGAGE	1971 PURCHASE	1976 PURCHASE	1981 PURCHASE	1986 PURCHASE
WALL ANCHORAGE					
Cost/sf $6					
Building Size: 29,400 sf					
TOTAL COST: $176,400					
Current Debt Serice	$0	($38,783)	($51,824)	($112,930)	($164,430)
Upgrade Debt Service (1)	($27,974)	($27,974)	($27,974)	($27,974)	($27,974)
Total Debt Service	($27,974)	($66,756)	($79,797)	($140,904)	($192,403)
BEFORE TAX CASH FLOW	$185,991	$147,208	$134,167	$64,830	$7,668
AFTER TAX CASH FLOW					
15% Bracket	$156,469	$123,382	$113,121	$62,928	$24,533
22% Bracket	$142,692	$112,263	$103,300	$62,040	$32,404
50% Bracket	$87,585	$67,788	$64,014	$58,488	$63,886
LEVEL 1					
Cost/sf $21					
Building Size: 29,400 sf					
TOTAL COST: $617,400					
Current Debt Service	$0	($38,783)	($51,824)	($112,930)	($164,430)
Upgrade Debt Service (1)	($97,908)	($97,908)	($97,908)	($97,908)	($97,908)
Total Debt Service	($97,908)	($136,691)	($149,731)	($210,838)	($262,338)
BEFORE TAX CASH FLOW	$116,056	$77,274	$64,233	($5,104)	($62,266)
AFTER TAX CASH FLOW					
15% Bracket	$92,967	$59,880	$49,619	($574)	($38,969)
22% Bracket	$82,192	$51,763	$42,800	$1,539	($28,096)
50% Bracket	$39,092	$19,295	$15,521	$9,995	$15,393
LEVEL 2					
Cost/sf $25					
Building Size: 29,400 sf					
TOTAL COST: $735,000					
Current Debt Serice	$0	($38,783)	($51,824)	($112,930)	($164,430)
Upgrade Debt Service (1)	($116,557)	($116,557)	($116,557)	($116,557)	($116,557)
Total Debt Service	($116,557)	($155,340)	($168,380)	($229,487)	($280,987)
BEFORE TAX CASH FLOW	$97,407	$58,625	$45,584	($23,753)	($80,915)
AFTER TAX CASH FLOW					
15% Bracket	$76,033	$42,946	$32,686	($17,508)	($55,902)
22% Bracket	$66,059	$35,630	$26,666	($14,594)	($44,229)
50% Bracket	$26,161	$6,363	$2,590	($2,936)	$2,462

(1) Debt service on upgrade costs is calculated as a 10-year loan at 10%.

BUILDING T-1

IMPACT OF SEISMIC UPGRADING ON CURRENT RENTS

UPGRADE LEVEL	COST PER SQFT	TOTAL COST	COST PER UNIT	MONTHLY RENT INCREASE PER UNIT	NEW RENT	PERCENT INCREASE OVER CURRENT RENTS
WALL ANCHORAGE	$6	$176,400	$1,764	$23	$308	8%
LEVEL 1	$21	$617,400	$6,174	$82	$367	29%
LEVEL 2	$25	$735,000	$7,350	$97	$382	34%

BUILDING T-2

Prototype T-2 is a five story Tenderloin building containing 40 studio apartments that rent at an average $380 per month. The building has no commercial space. As in prototype T-1, the vacancy/loss factor is six percent.

Rents from this building do not support a mortgage of 80% of the 1986 estimated purchase price; therefore, the building would not be able to support the additional debt service required for seismic upgrading. However, in contrast to the long-term ownership common to individuals and family associations in Chinatown, the investment scenario typical for buildings of this sort may involve equity contributions from a number of partners who share in the income and tax losses generated by the building.

PROTOTYPE #	T-2
NEIGHBORHOOD	TENDERLOIN
OWNERSHIP	PRIVATE
BUILDING TYPE	APARTMENTS NO COMMERCIAL
# STORIES	5 WITH ELEVATOR
TOTAL BUILDING AREA (1)	13,750 SQFT
# RES. UNITS	40 STUDIOS
RESIDENTIAL RENT	$380 /STUDIO/MONTH
COMMERCIAL AREA	0 SQFT
COMM. RENT	SQFT/MO

(1) Building area is calculated as follows:

40 studios @ 275 sf = 11000 sf
x 1.25 circulation factor = 13750 sf TOTAL

1986 FINANCIAL PRO FORMA BY YEAR OF PURCHASE: PROTOTYPE T-2

		(1) NO MORTGAGE	1971 PURCHASE	1976 PURCHASE	1981 PURCHASE	1986 PURCHASE
1986 Gross Income - Residential		$182,400	$182,400	$182,400	$182,400	$182,400
1986 Gross Income - Commercial		$0	$0	$0	$0	$0
GROSS POSSIBLE INCOME		$182,400	$182,400	$182,400	$182,400	$182,400
(Less) Vacancy/Bad Debt	(2)	($10,900)	($10,900)	($10,900)	($10,900)	($10,900)
EFFECTIVE GROSS INCOME		$171,500	$171,500	$171,500	$171,500	$171,500
(Less) Operating Expenses	(3)	($55,715)	($55,715)	($55,715)	($55,715)	($55,715)
(Less) Real Estate Taxes	(4)	($0)	($8,256)	($8,256)	($12,962)	($18,240)
Expense and Taxes: Per Unit		1393	1599	1599	1717	1849
Expense and Taxes: as % of EGI		32%	37%	37%	40%	43%
NET OPERATING INCOME		$107,529	$107,529	$107,529	$102,823	$97,545
(Less) Current Debt Service	(5)	0	(26,574)	(48,433)	(85,778)	(84,819)
BEFORE TAX CASH FLOW		107,529	80,955	59,096	17,045	12,726
1986 Depreciation Deduction	(6)	0	$7,200	$12,000	$55,744	$112,640
1986 Interest Deduction		0	$18,817	$40,808	$77,861	$80,000
TAXABLE INCOME		107,529	$81,512	$54,721	($30,782)	($95,095)
(Less) Tax						
15% Bracket		($16,129)	($12,227)	($8,208)	$4,617	$14,264
22% Bracket		($23,656)	($17,933)	($12,039)	$6,772	$20,921
50% Bracket		($53,764)	($40,756)	($27,360)	$15,391	$47,548
AFTER TAX CASH FLOW						
15% Bracket		$91,399	$69,285	$67,304	($26,164)	($80,831)
22% Bracket		$83,872	$63,579	$42,682	($24,010)	($74,174)
50% Bracket		$53,764	$40,756	$27,360	($15,391)	($47,548)

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(1) This column represents a building under long-term ownership with the mortgage fully repaid and all depreciation taken.
(2) Vacancy/Bad Debt Allowance is calculated at 6% of residential gross.
(3) Operating Expenses are calculated using the methods described in Section IV.
(4) Real Estate Taxes are 1.14% of 1986 assessed value.
(5) Debt Service is calculated based on mortgage terms in the year purchased as explained in Section V.
(6) Depreciation deduction reflects a switch from accelerated to straight line method for buildings purchased in 1971, 1976 and 1981 to maximize deduction.

MORTGAGE AND DEPRECIATION CALCULATION

		1971 PURCHASE	1976 PURCHASE	1981 PURCHASE	1986 PURCHASE
TOTAL PURCHASE PRICE	(1)	360,000	600,000	1,040,000	1,600,000
Maximum Loan/Value Ratio		80%	80%	80%	80%
Minimum Debt Coverage Ratio		1.15	1.15	1.15	1.15
MORTGAGE AMOUNT	(2)	$288,000	$480,000	$832,000	$822,700
% of Purchase Price		80%	80%	80%	51%
Interest Rate	(3)	8.50%	9.50%	9.75%	9.75%
Amortization Period	(4)	30 yrs	30 yrs	30 yrs	30 yrs
DEBT SERVICE		($26,574)	($48,433)	($85,778)	($84,819)
Depreciation Method	(5)	40 yrs 125%	40 yrs 125%	15 yrs 175%	19 yrs 175%
Initial Depreciable Basis	(6)	$288,000	$480,000	$832,000	$1,280,000

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(1) Purchase price is calculated by the method described in Section V.

(2) Mortgage amount is calculated as the lesser of an 80% loan-to-value ratio or a 1.15% debt coverage ratio.

(3) Rates for 1981 and 1986 mortgages are variable. Current debt service is calculated at 1986 rates.

(4) 1981 and 1986 mortgages are 15-year loans with a 30-year amortization schedule.

(5) Depreciation is calculated according to the method effect in the year of purchase.

(6) Depreciable basis calculation assumes building value is 80% of total building cost.

CASH FLOW BY UPGRADE OPTION AND MORTGAGE DATE   Prototype T-2

UPGRADE OPTION	NO MORTGAGE	1971 PURCHASE	1976 PURCHASE	1981 PURCHASE	1986 PURCHASE
WALL ANCHORAGE					
Cost/sf $6					
Building Size: 13,750 sf					
TOTAL COST: $82,500					
Current Debt Serice	$0	($26,574)	($48,433)	($85,778)	($84,819)
Upgrade Debt Service (1)	($13,083)	($13,083)	($13,083)	($13,083)	($13,083)
Total Debt Service	($13,083)	($39,657)	($61,516)	($98,861)	($97,902)
BEFORE TAX CASH FLOW	$94,446	$67,872	$46,013	$3,962	($357)
AFTER TAX CASH FLOW					
15% Bracket	$79,520	$56,849	$39,008	$9,783	$15,110
22% Bracket	$72,554	$51,704	$35,739	$12,499	$22,329
50% Bracket	$44,692	$31,127	$22,663	$23,364	$51,201
LEVEL 1					
Cost/sf $21					
Building Size: 13,750 sf					
TOTAL COST: $288,750					
Current Debt Service	$0	($26,574)	($48,433)	($85,778)	($84,819)
Upgrade Debt Service (1)	($45,790)	($45,790)	($45,790)	($45,790)	($45,790)
Total Debt Service	($45,790)	($72,364)	($94,223)	($131,568)	($130,609)
BEFORE TAX CASH FLOW	$61,739	$35,165	$13,305	($28,745)	($33,064)
AFTER TAX CASH FLOW					
15% Bracket	$49,821	$27,150	$9,309	($19,916)	($14,589)
22% Bracket	$44,259	$23,409	$7,444	($15,796)	($5,967)
50% Bracket	$22,013	$8,448	($17)	$684	$28,522
LEVEL 2					
Cost/sf $25					
Building Size: 13,750 sf					
TOTAL COST: $343,750					
Current Debt Serice	$0	($26,574)	($48,433)	($85,778)	($84,819)
Upgrade Debt Service (1)	($54,512)	($54,512)	($54,512)	($54,512)	($54,512)
Total Debt Service	($54,512)	($81,086)	($102,945)	($140,290)	($139,331)
BEFORE TAX CASH FLOW	$53,017	$26,443	$4,583	($37,467)	($41,786)
AFTER TAX CASH FLOW					
15% Bracket	$41,901	$19,230	$1,389	($27,836)	($22,508)
22% Bracket	$36,714	$15,864	($101)	($23,341)	($13,512)
50% Bracket	$15,965	$2,400	($6,064)	($5,363)	$22,474

(1) Seismic upgrades assumed to be fully financed with 10-year improvment loan at 10%.

BUILDING T-2

IMPACT OF SEISMIC UPGRADING ON CURRENT RENTS

UPGRADE LEVEL	COST PER SQFT	TOTAL COST	COST PER UNIT	MONTHLY RENT INCREASE PER UNIT	NEW RENT	PERCENT INCREASE OVER CURRENT RENTS
WALL ANCHORAGE	$6	$82,500	$2,063	$27	$407	7%
LEVEL 1	$21	$288,750	$7,219	$95	$475	25%
LEVEL 2	$25	$343,750	$8,594	$114	$494	30%

BUILDING T-3

With the exception that it is owned and managed by a nonprofit organization, the building represented by prototype T-3 is identical to that described by prototype T-2.

Demonstrating practices common to nonprofit owners, the rents in this building are lower ($300 per unit) and the operating expenses are higher than for the comparable privately-owned building. Because the demand for inexpensive units is high, this building's vacancy rate is lower than that used in prototype T-2.

Reflecting the lower rents and higher expenses, this building's operating expenses, while amounting to $2,000 per unit, consume a substantial portion of the effective gross income.

As in prototype C-3, we have assumed that sixty percent of the purchase price has been covered by grants or deferred-interest loans.

Although the monthly rent increases that would be allowed if this building is reinforced are the same as for building T-2, the presumably very low-income tenants in this nonprofit-owned building will face a larger percentage increase over their current rent.

PROTOTYPE #	T-3
NEIGHBORHOOD	TENDERLOIN
OWNERSHIP	NON-PROFIT
BUILDING TYPE	APARTMENTS NO COMMERCIAL
# STORIES	5 WITH ELEVATOR
TOTAL BUILDING AREA (1)	13,750 SQFT
# RES. UNITS	40 STUDIOS
RESIDENTIAL RENT	$300 /ROOM/MONTH
COMMERCIAL AREA	0 SQFT
COMM. RENT	SQFT/MO

(1) Building area is calculated as follows:

40 studios @ 275 sf = 11000 sf
x 1.25 circulation factor = 13750 sf TOTAL

1986 FINANCIAL PRO FORMA BY YEAR OF PURCHASE: PROTOTYPE T-3

		(1) NO MORTGAGE	1971 PURCHASE	1976 PURCHASE	1981 PURCHASE	1986 PURCHASE
1986 Gross Income - Residential		$144,000	$144,000	$144,000	$144,000	$144,000
1986 Gross Income - Commercial		$0	$0	$0	$0	$0
GROSS POSSIBLE INCOME		$144,000	$144,000	$144,000	$144,000	$144,000
(Less) Vacancy/Bad Debt	(2)	($7,200)	($7,200)	($7,200)	($7,200)	($4,300)
EFFECTIVE GROSS INCOME		$136,800	$136,800	$136,800	$136,800	$136,800
(Less) Operating Expenses	(3)	($59,028)	($59,028)	($59,028)	($59,028)	($59,028)
(Less) Real Estate Taxes	(4)	($8,256)	($8,256)	($8,256)	($12,962)	($18,240)
Expenses and Taxes: Per Unit		1682	1682	1682	1800	1932
Expenses and Taxes: as % of EGI		49%	49%	49%	53%	56%
NET OPERATING INCOME		$69,516	$69,516	$69,516	$64,810	$59,532
(Less) Current Debt Service	(5)	0	(13,287)	(24,217)	(42,889)	(51,766)
BEFORE TAX CASH FLOW		69,516	56,229	45,299	21,921	7,766
1986 Depreciation Deduction	(6)	0	$7,200	$12,000	$58,240	$170,240
1986 Interest Deduction		0	$9,409	$20,404	$38,931	$48,825
TAXABLE INCOME	(7)	69,516	$52,907	$37,112	($32,361)	($159,533)
(Less) Tax						
15% Bracket		($10,427)	($7,936)	($5,567)	$4,854	$23,930
22% Bracket		($15,293)	($11,640)	($8,165)	$7,119	$35,097
50% Bracket		($34,758)	($26,453)	($18,556)	$16,180	$79,767
AFTER TAX CASH FLOW						
15% Bracket		$59,088	$48,293	$39,732	$26,775	$31,696
22% Bracket		$54,222	$44,589	$37,135	$29,041	$42,863
50% Bracket		$34,758	$29,776	$26,743	$38,102	$87,533

(1) This column represents a building under long-term ownership with the mortgage fully repaid and all depreciation taken.

(2) Vacancy/Bad Debt Allowance is calculated at 5% of residential gross.

(3) Operating Expenses are calculated using the methods described in Section IV.

(4) Real Estate Taxes are 1.14% of 1986 assessed value.

(5) Debt Service is calculated based on mortgage terms in the year purchased as explained in Section V.

(6) Depreciation deduction reflects a switch from accelerated to straight line method for buildings purchased in 1971, 1976, and 1981 to maximize deduction.

(7) Tax deductions are shown to demonstrate tax benefits passed through to limited partners if non-profit owner syndicates property.

MORTGAGE AND DEPRECIATION CALCULATION

		1971 PURCHASE	1976 PURCHASE	1981 PURCHASE	1986 PURCHASE
TOTAL PURCHASE PRICE	(1)	360,000	600,000	1,040,000	1,600,000
Maximum Loan/Value Ratio		40%	40%	40%	40%
Minimum Debt Coverage Ratio		1.15	1.15	1.15	1.15
MORTGAGE AMOUNT	(2)	$144,000	$240,000	$416,000	$502,100
Actual Loan/Value Ratio		40%	40%	40%	31%
Interest Rate	(3)	8.50%	9.50%	9.75%	9.75%
Amortization Period	(4)	30 yrs	30 yrs	30 yrs	30
DEBT SERVICE		($13,287)	($24,217)	($42,889)	($51,766)
Depreciation Method	(5)	40 yrs	40 yrs	15 yrs	19 yrs
Acceleration (if applicable)		125%	125%	175%	175%
Initial Depreciable Basis	(6)	$288,000	$480,000	$832,000	$1,280,000

---

(1) Purchase price is calculated by the method described in Section V.

(2) Mortgage amount is calculated as 40% of the purchase price. Non-Profit owner is assumed to receive subsid for remainder of purchase price.

(3) Rates for 1981 and 1986 mortgages are variable. Current debt service is calculated at 1986 rates.

(4) 1981 and 1986 motgages are 15-year loans with a 30-year amortization schedule.

(5) Depreciation is calculated according to the method effect in the year of purchase.

(6) Depreciable basis calculation assumes building value is 80% of total building cost.

CASH FLOW BY UPGRADE OPTION AND MORTGAGE DATE Prototype T-3

UPGRADE OPTION	NO MORTGAGE	1971 PURCHASE	1976 PURCHASE	1981 PURCHASE	1986 PURCHASE
WALL ANCHORAGE					
Cost/sf $6					
Building Size: 13,750 sf					
TOTAL COST: $82,500					
Current Debt Serice	$0	($13,287)	($24,217)	($42,889)	($51,766)
Upgrade Debt Service (1)	($13,083)	($13,083)	($13,083)	($13,083)	($13,083)
Total Debt Service	($13,083)	($26,370)	($37,300)	($55,972)	($64,849)
BEFORE TAX CASH FLOW	$56,433	$43,146	$32,216	$8,838	($5,317)
AFTER TAX CASH FLOW					
15% Bracket	$47,209	$36,413	$27,853	$14,896	$19,817
22% Bracket	$42,904	$33,271	$25,817	$17,723	$31,545
50% Bracket	$25,686	$20,704	$17,671	$29,030	$78,461
LEVEL 1					
Cost/sf $16					
Building Size: 13,750 sf					
TOTAL COST: $220,000					
Current Debt Service	$0	($13,287)	($24,217)	($42,889)	($51,766)
Upgrade Debt Service (1)	($34,888)	($34,888)	($34,888)	($34,888)	($34,888)
Total Debt Service	($34,888)	($48,175)	($59,104)	($77,777)	($86,654)
BEFORE TAX CASH FLOW	$34,628	$21,341	$10,411	($12,966)	($27,122)
AFTER TAX CASH FLOW					
15% Bracket	$27,410	$16,614	$8,054	($4,903)	$17
22% Bracket	$24,041	$14,408	$6,953	($1,141)	$12,682
50% Bracket	$10,567	$5,584	$2,552	$13,910	$63,341
LEVEL 2					
Cost/sf $21					
Building Size: 13,750 sf					
TOTAL COST: $288,750					
Current Debt Serice	$0	($13,287)	($24,217)	($42,889)	($51,766)
Upgrade Debt Service (1)	($45,790)	($45,790)	($45,790)	($45,790)	($45,790)
Total Debt Service	($45,790)	($59,077)	($70,007)	($88,679)	($97,556)
BEFORE TAX CASH FLOW	$23,726	$10,439	($491)	($23,869)	($38,024)
AFTER TAX CASH FLOW					
15% Bracket	$17,510	$6,714	($1,846)	($14,803)	($9,883)
22% Bracket	$14,609	$4,976	($2,479)	($10,573)	$3,250
50% Bracket	$3,006	($1,976)	($5,008)	$6,350	$55,781

(1) Seismic upgrades financed with 10-year improvment loan at 10%.

BUILDING T-3

IMPACT OF SEISMIC UPGRADING ON CURRENT RENTS

UPGRADE LEVEL	COST PER SQFT	TOTAL COST	COST PER UNIT	MONTHLY RENT INCREASE PER UNIT	NEW RENT	PERCENT INCREASE OVER CURRENT RENTS
WALL ANCHORAGE	$6	$82,500	$2,063	$27	$327	9%
LEVEL 1	$21	$288,750	$7,219	$95	$395	32%
LEVEL 2	$25	$343,750	$8,594	$114	$414	38%

BUILDING B-1

Prototype B-1 represents a four story Bush Street apartment building. The building has 20 studio apartments that rent at an average of $420 per month, and 15 one-bedroom units whose rents average $520. Reflecting the fact that this neighborhood has less turnover than the Tenderloin, the vacancy/collection loss rate for this building is 4%.

This prototype reflects a typical unreinforced masonry building located in the Bush Street corridor. Seventy-three percent of the URM residential buildings in this area are apartment buildings. One-third of these are four stories tall, and 35% of the Bush Street apartment buildings have twenty to thirty-five units.

Purchase prices for buildings in this location in the last few years appear to be somewhat too high for the current rents to support. If the estimated sales prices are correct, owners may be paying higher prices at the present time with the expectation that rents will rise substantially in the near future.

PROTOTYPE #	B-1
NEIGHBORHOOD	BUSH STREET
OWNERSHIP	PRIVATE
BUILDING TYPE	APARTMENTS NO COMMERCIAL
# STORIES	4 NO ELEVATOR
TOTAL BUILDING AREA (1)	13,438 SQFT
# RES. UNITS	20 STUDIOS 15 1-BEDROOMS
RESIDENTIAL RENT	$420 /STUDIO/MONTH $520 /1-BR/MONTH
COMMERCIAL AREA	0 SQFT
COMM. RENT	SQFT/MO

(1) Building area is calculated as follows:

20 studios @ 275 sf and 15 1BR @ 350 sf = 10750 sf
x 1.25 circulation factor = 13438 sf TOTAL

1986 FINANCIAL PRO FORMA BY YEAR OF PURCHASE: PROTOTYPE B-1

	(1) NO MORTGAGE	1971 PURCHASE	1976 PURCHASE	1981 PURCHASE	1986 PURCHASE
1986 Gross Income - Residential	$194,400	$194,400	$194,400	$194,400	$194,400
1986 Gross Income - Commercial	$0	$0	$0	$0	$0
GROSS POSSIBLE INCOME	$194,400	$194,400	$194,400	$194,400	$194,400
(Less) Vacancy/Bad Debt (2)	($7,800)	($7,800)	($7,800)	($7,800)	($7,800)
EFFECTIVE GROSS INCOME	$186,600	$186,600	$186,600	$186,600	$186,600
(Less) Operating Expenses (3)	($50,081)	($50,081)	($50,081)	($50,081)	($50,081)
(Less) Real Estate Taxes (4)	($6,743)	($6,743)	($6,743)	($13,522)	($17,955)
Expenses and Taxes: Per Unit	1624	1624	1624	1817	1944
Expenses and Taxes: as % of EGI	30%	30%	30%	34%	36%
NET OPERATING INCOME	$129,776	$129,776	$129,776	$122,997	$118,564
(Less) Current Debt Service (5)	0	(28,419)	(39,554)	(89,490)	(103,099)
BEFORE TAX CASH FLOW	129,776	101,357	90,223	33,507	15,465
1986 Depreciation Deduction (6)	0	$7,700	$9,800	$58,156	$110,880
1986 Interest Deduction	0	$20,124	$33,327	$81,230	$97,243
TAXABLE INCOME	129,776	$101,952	$86,649	($16,389)	($89,559)
(Less) Tax					
15% Bracket	($19,466)	($15,293)	($12,997)	$2,458	$13,434
22% Bracket	($28,551)	($22,430)	($19,063)	$3,606	$19,703
50% Bracket	($64,888)	($50,976)	($43,325)	$8,195	$44,780
AFTER TAX CASH FLOW					
15% Bracket	$110,310	$86,065	$77,225	$35,965	$28,899
22% Bracket	$101,226	$78,928	$71,160	$37,113	$35,168
50% Bracket	$64,888	$50,381	$46,898	$41,702	$60,245

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(1) This column represents a building under long-term ownership with the mortgage fully repaid and all depreciation taken.

(2) Vacancy/Bad Debt Allowance is calculated at 4% of residential gross.

(3) Operating Expenses are calculated using the methods described in Section IV.

(4) Real Estate Taxes are 1.14% of 1986 assessed value.

(5) Debt Service is calculated based on mortgage terms in the year purchased as explained in Section V.

(6) Depreciation deduction reflects a switch from accelerated to straight line method for buildings purchased 1976, and 1981 to maximize deduction.

MORTGAGE AND DEPRECIATION CALCULATION

		1971 PURCHASE	1976 PURCHASE	1981 PURCHASE	1986 PURCHASE
TOTAL PURCHASE PRICE	(1)	$385,000	$490,000	$1,085,000	$1,575,000
Maximum Loan/Value Ratio		80%	80%	80%	80%
Minimum Debt Coverage Ratio		1.15	1.15	1.15	1.15
MORTGAGE AMOUNT	(2)	$308,000	$392,000	$868,000	$1,000,000
% of Purchase Price		80%	80%	80%	63%
Interest Rate	(3)	8.50%	9.50%	9.75%	9.75%
Amortization Period	(4)	30 yrs	30 yrs	30 yrs	30 yrs
DEBT SERVICE		($28,419)	($39,554)	($89,490)	($103,099)
Depreciation Method	(5)	40 yrs	40 yrs	15 yrs	19 yrs
Acceleration (if applicable)		125%	125%	175%	175%
Initial Depreciable Basis	(6)	$308,000	$392,000	$868,000	$1,260,000

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(1) Purchase price is calculated by the method described in Section V.

(2) Mortgage amount is calculated as the lesser of an 80% loan-to-value ratio or a 1.15% debt coverage ratio.

(3) Rates for 1981 and 1986 mortgages are variable. Current debt service is calculated at 1986 rates.

(4) 1981 and 1986 motgages are 15-year loans with a 30-year amortization schedule.

(5) Depreciation is calculated according to the method effect in the year of purchase.

(6) Depreciable basis calculation assumes building value is 80% of total building cost.

CASH FLOW BY UPGRADE OPTION AND MORTGAGE DATE   Prototype B-1

UPGRADE OPTION	NO MORTGAGE	1971 PURCHASE	1976 PURCHASE	1981 PURCHASE	1986 PURCHASE
WALL ANCHORAGE					
Cost/sf $6					
Building Size: 13,438 sf					
TOTAL COST: $80,628					
Current Debt Serice	$0	($28,419)	($39,554)	($89,490)	($103,099)
Upgrade Debt Service (1)	($12,786)	($12,786)	($12,786)	($12,786)	($12,786)
Total Debt Service	($12,786)	($41,205)	($52,340)	($102,276)	($115,885)
BEFORE TAX CASH FLOW	$116,990	$88,571	$77,437	$20,721	$2,679
AFTER TAX CASH FLOW					
15% Bracket	$98,695	$74,449	$65,610	$24,350	$17,284
22% Bracket	$90,157	$67,859	$60,091	$26,044	$24,099
50% Bracket	$56,005	$41,498	$38,014	$32,818	$51,361
LEVEL 1					
Cost/sf $16					
Building Size: 13,438 sf					
TOTAL COST: $215,008					
Current Debt Service	$0	($28,419)	($39,554)	($89,490)	($103,099)
Upgrade Debt Service (1)	($34,096)	($34,096)	($34,096)	($34,096)	($34,096)
Total Debt Service	($34,096)	($62,515)	($73,650)	($123,586)	($137,195)
BEFORE TAX CASH FLOW	$95,680	$67,261	$56,127	($589)	($18,631)
AFTER TAX CASH FLOW					
15% Bracket	$79,350	$55,104	$46,265	$5,005	($2,061)
22% Bracket	$71,729	$49,431	$41,663	$7,616	$5,672
50% Bracket	$41,246	$26,739	$23,255	$18,059	$36,602
LEVEL 2					
Cost/sf $21					
Building Size: 13,438 sf					
TOTAL COST: $282,198					
Current Debt Serice	$0	($28,419)	($39,554)	($89,490)	($103,099)
Upgrade Debt Service (1)	($44,751)	($44,751)	($44,751)	($44,751)	($44,751)
Total Debt Service	($44,751)	($73,170)	($84,305)	($134,241)	($147,850)
BEFORE TAX CASH FLOW	$85,025	$56,606	$45,471	($11,244)	($29,286)
AFTER TAX CASH FLOW					
15% Bracket	$69,675	$45,429	$36,590	($4,670)	($11,736)
22% Bracket	$62,511	$40,213	$32,445	($1,602)	($3,546)
50% Bracket	$33,857	$19,350	$15,867	$10,671	$29,214

(1) Seismic upgrades assumed to be fully financed with 10-year improvement loan at 10%.

BUILDING B-1

IMPACT OF SEISMIC UPGRADING ON CURRENT RENTS

UPGRADE LEVEL	COST PER SQFT	TOTAL COST	COST PER UNIT	MONTHLY RENT INCREASE PER UNIT	NEW RENT	PERCENT INCREASE OVER CURRENT RENTS
WALL ANCHORAGE	$6	$80,628	$2,304	$30	$425-520	6-8%
LEVEL 1	$16	$215,008	$6,143	$81	$471-576	16-21%
LEVEL 2	$21	$282,198	$8,063	$107	$502-602	22-27%

II. UNREINFORCED MASONRY BUILDING CHARACTERISTICS

This section includes data regarding the physical characteristics of San Francisco's URM buildings. Included is information about location, unit type, and building height and size.

Table II-1 shows the distribution of URM residential buildings by building type and by location. The table indicates that 376, or nearly one-half of the total, are apartment buildings. One-third, or 249 of San Francisco's residential URM buildings are single-room occupancy hotels.

Table II-1 RESIDENTIAL URM BUILDINGS BY BUILDING TYPE

	NUMBER OF URM BLDGS.	% OF URM RESIDENTIAL BLDGS.
ALL URM BUILDINGS	2058	
APARTMENT BUILDINGS	376	49%
HOTELS	249	32%
FLATS	76	10%
SINGLE-FAMILY DWELLINGS	55	7%
CONDOS & OTHER	13	2%
URM RESIDENTIAL BUILDINGS	769	100%

SOURCE: San Francisco Department of Public Works, Bureau of Building Inspection, "Survey of Hazardous Buildings," October 1986.

Table II-2 reveals that seventy percent of the city's URM apartment buildings and residential hotels are located within the census tracts that approximate the Tenderloin and Chinatown neighborhoods.

Table II-2 RESIDENTIAL URM BUILDINGS BY LOCATION

LOCATION (a)	APARTMENT BLDGS. (b)		RESIDENTIAL HOTELS (b)	
TENDERLOIN				
CORE AREA	100		75	
NEARBY TRACTS	89		17	
SUBTOTAL	189	(50%)	92	(37%)
CHINATOWN				
CORE AREA	76		54	
NEARBY TRACTS	7		27	
SUBTOTAL	83	(22%)	81	(33%)
BUSH ST. CORRIDOR	25	(7%)	2	(1%)
TOTAL - STUDY AREA	297	(79%)	175	(70%)
ADJACENT TRACTS	50	(13%)	35	(14%)
ALL OTHER AREAS	29	(8%)	39	(16%)
TOTAL	376	(100%)	249	(100%)

(a) The Tenderloin "core area" includes U.S. Census tracts 122, 123, 124, and 125. Nearby are tracts 120 and 121. The "Chinatown core area" includes tracts 113, 114, and 118. Nearby tracts are 107 and 115. The Bush Street corridor is represented by tract 119. Tracts adjacent to the study area are: 106, 111, 117, 131, and 176.

(b) Buildings that have both apartment and hotel units are counted in that category having the majority of units.

SOURCE: San Francisco Department of Public Works, Bureau of Building Inspection, "Survey of Hazardous Buildings," October 1986.

Tables II-3, II-4, and II-5 show the percentage of Tenderloin, Chinatown, and Bush Street apartment and residential hotel buildings that are of unreinforced masonry construction. The tables indicate that over half of the residential buildings, and nearly sixty percent of the residential units in Chinatown's three core census tracts are URM. Ninety-two percent of the residential hotel rooms in the core Chinatown tracts are in URM buildings.

One-third of the apartment buildings and sixty percent the residential hotels located in the Tenderloin's core census tracts are URM. These buildings constitute forty-one percent of all residential units in the neighborhood.

Twenty-two percent of the units located in the Bush Street Corridor tract 119 are in URM buildings.

Table II-3

CHINATOWN CORE AREA - PERCENTAGE OF RESIDENTIAL UNITS AND BUILDINGS OF UNREINFORCED MASONRY CONSTRUCTION

	APARTMENTS (a)		RES. HOTELS		TOTAL	
CENSUS TRACT	BLDGS.	UNITS	BLDGS.	UNITS	BLDGS.	UNITS
113 RES BLDGS	112	1117	11	234	123	1351
URM BLDGS	24	241	11	232	35	473
% URM	21%	22%	100%	99%	28%	35%
114 RES BLDGS	40	827	31	994	71	1821
URM BLDGS	28	312	31	953	59	1265
% URM	70%	37%	100%	96%	83%	69%
118 RES BLDGS	32	367	16	380	48	747
URM BLDGS	24	246	12	297	36	543
% URM	75%	67%	75%	78%	75%	73%
TOTAL - CHINATOWN CORE						
RES BLDGS	184	2311	58	1608	242	3919
URM BLDGS	76	799	54	1482	130	2281
% URM	41%	35%	93%	92%	54%	58%

(a) Buildings that have both apartment and hotel units are classified in that category having the majority of units.

SOURCE: City and County of San Francisco, Department of Public Works, Bureau of Building Inspection, "Survey of Hazar dous Buildings," October, 1986, and Property Conservation Division, "Apartment and Hotel Statistics," 1986.

Table II-4

TENDERLOIN CORE AREA - PERCENTAGE OF RESIDENTIAL UNITS AND BUILDINGS OF UNREINFORCED MASONRY CONSTRUCTION

CENSUS TRACT		APARTMENTS (a)		RES. HOTELS		TOTAL	
		BLDGS.	UNITS	BLDGS.	UNITS	BLDGS.	UNITS
122	RES BLDGS	120	3191	15	636	135	3827
	URM BLDGS	49	1185	12	522	61	1707
	% URM	41%	37%	80%	82%	45%	45%
123	RES BLDGS	75	1909	39	2476	114	4385
	URM BLDGS	15	597	21	1207	36	1804
	% URM	20%	31%	54%	49%	32%	41%
124	RES BLDGS	74	2478	33	1719	107	4197
	URM BLDGS	24	618	19	808	43	1426
	% URM	32%	25%	58%	47%	40%	34%
125	RES BLDGS	43	1471	40	2589	83	4060
	URM BLDGS	11	558	24	1259	35	1817
	% URM	26%	38%	60%	49%	42%	45%
TOTAL #							
	RES BLDGS	312	9049	127	7420	439	16,469
	URM BLDGS	99	2958	76	3796	175	6754
	% URM	32%	33%	60%	51%	40%	41%

(a) Buildings that have both apartment and hotel units are classified in that category having the majority of units.

SOURCE: City and County of San Francisco, Department of Public Works, Bureau of Building Inspection, "Survey of Hazar dous Buildings," October, 1986, and Property Conservation Division, "Apartment and Hotel Statistics," 1986.

Table II-5

BUSH STREET CORRIDOR - PERCENTAGE OF RESIDENTIAL UNITS AND BUILDINGS OF UNREINFORCED MASONRY CONSTRUCTION

CENSUS TRACT 119	APARTMENTS(a)		RES. HOTELS		TOTAL	
	BLDGS.	UNITS	BLDGS.	UNITS	BLDGS.	UNITS
RES BLDGS	158	3746	6	328	164	4074
URM BLDGS	25	770	2	132	27	902
% URM	16%	21%	13%	40%	16%	22%

(a) Buildings that have both apartment and hotel units are classified in that category having the majority of units.

SOURCE: City and County of San Francisco, Department of Public Works, Bureau of Building Inspection, "Survey of Hazar dous Buildings," October, 1986, and Property Conservation Division, "Apartment and Hotel Statistics," 1986.

Tables II-6 through II-9 provide information about the average size of unreinforced masonry buildings. Table II-6 indicates that 65% of the URM's in Chinatown are three or fewer stories high. In contrast, the buildings in the Tenderloin and along Bush Street are typically four or more stories. Table II-7 shows the square footage size distribution of all URM hotel and apartment buildings in the city. Tables II-8 and II-9 indicate the average number of units per building in the three selected neighborhoods.

Table II-6 UNREINFORCED MASONRY BUILDING HEIGHT

CHINATOWN Number of Stories	NUMBER OF BUILDINGS Census Tract 113	 114	 118	TOTAL Number of Bldgs.	 Percent of Bldgs.
3 or less	30	39	16	85	65%
4	4	17	16	37	29%
5	1	3	1	5	4%
6	0	0	3	3	2%
TOTAL	35	59	36	130	100%

TENDERLOIN Number of Stories	NUMBER OF BUILDINGS Census Tract 122	 123	 124	 125	TOTAL Number of Bldgs.	 Percent of Bldgs.
3 or less	23	2	20	8	53	30%
4	18	6	14	7	45	26%
5	14	8	5	8	35	20%
6	5	13	4	9	31	18%
More than 6	1	7	0	3	11	6%
TOTAL	61	36	43	35	175	100%

BUSH STREET (a) Number of Stories	NUMBER OF BUILDINGS	PERCENT OF BUILDINGS
3 or less	8	22%
4	12	32%
5	10	27%
6	5	14%
More than 6	2	5%
TOTAL	37	100%

(a) In this table the Bush Street Corridor includes buildings on Bush Street between Mason and Van Ness, rather than census tract 119 which was used in previous tables.

SOURCE: City and County of San Francisco, Department of Public Works, Bureau of Building Inspection, "Survey of Hazardous Buildings," October, 1986.

TABLE II-7

UNREINFORCED MASONRY BUILDING SQUARE FOOTAGE

SQUARE FEET	NUMBER OF URM APT. BLDGS.	PERCENT OF URM APTS.	NUMBER OF URM HOTELS	PERCENT OF URM HOTELS
Under 5,000	8	13%	61	24%
5,001 - 10,000	86	23%	49	20%
10,001 - 15,000	69	18%	29	12%
15,001 - 20,000	54	14%	23	9%
20,001 - 25,000	43	11%	21	8%
25,001 - 30,000	12	3%	9	4%
30,001 - 35,000	25	7%	17	7%
35,001 - 40,000	12	3%	9	4%
Over 40,000	27	7%	31	12%
TOTAL	376	99% (a)	249	100%

(a) Sum does not total to 100% due to rounding.

SOURCE: City and County of San Francisco, Department of Public Works, Bureau of Building Inspection, "Survey of Hazardous Buildings," October 1986.

Table II-8

NUMBER OF UNITS PER BUILDING IN CHINATOWN UNREINFORCED MASONRY RESIDENTIAL BUILDINGS (a)

RESIDENTIAL HOTELS

NUMBER OF UNITS	NUMBER OF URM BUILDINGS	PERCENT OF URM BLDGS.
3 - 20	45	54.9%
21 - 50	22	26.8%
51 - 88	8	9.8%
100 - 182	7	8.5%
TOTAL	82	100%

APARTMENT BUILDINGS

NUMBER OF UNITS	NUMBER OF URM BUILDINGS	PERCENT OF URM BLDGS.
1-16	65	57%
7-12	28	25%
13-30	21	18%
TOTAL	114	100%

(a) In this table "Chinatown" is defined as that area described in the San Francisco Department of City Planning, Chinatown Planning and Rezoning Study Background Issue Papers, 1986.

SOURCE: San Francisco Department of City Planning, Chinatown Planning and Rezoning Study Background Issue Papers, 1986, and City and County of San Francisco, Department of Public Works, Bureau of Building Inspection, "Survey of Hazardous Buildings," October 1986.

TABLE II-9

NUMBER OF UNITS PER BUILDING IN BUSH STREET UNREINFORCED MASONRY APARTMENT BUILDINGS (a)

NUMBER OF UNITS	NUMBER OF BUILDINGS	PERCENT OF BUILDINGS
6 TO 9	5	14%
12 - 17	10	27%
20 - 35	13	35%
38 - 59	7	19%
68 - 99	2	5%
TOTAL	37	100%

(a) In this table the Bush Street Corridor includes buildings on Bush Street between Mason and Van Ness, rather than census tract 119 which was used in previous tables.

SOURCE: City and County of San Francisco, Department of Public Works, Bureau of Building Inspection,"Survey of Hazardous Buildings," October 1986.

III. INCOME CHARACTERISTICS

This section includes income information for residential buildings in Chinatown, the Tenderloin, and along the Bush Street Corridor. Part A describes residential rents for each neighborhood, and includes data for both occupied units and for vacant units currently on the market. In addition, the section provides information on factors that influence rent levels. These include form of building ownership, and vacancy and turnover rates.

Income from ground-floor space constitutes a substantial percentage of total revenue for many buildings. Typical commercial rents are described in Part B of this section.

A. RESIDENTIAL RENT

Tables III-1 through III-6 show residential rent data collected for buildings in the three San Francisco neighborhoods that have a high concentration of unreinforced masonry buildings. This section summarizes both the data that the tables present and the additional information supplied by property owners and managers.

CHINATOWN

Rents for Currently Occupied Units

Rents in Chinatown are considerably below market-rate rents for the city. Tables III-1 and III-2 show monthly rents for residential hotel rooms and apartments in this neighborhood. Property managers that we consulted agreed that typical rents for occupied Chinatown units are $160 for a hotel room, $235 for a studio, and $265 for a one bedroom apartment.

Form of Ownership Influence on Rents

Many Chinatown hotels are owned by family and district associations which have historically provided low-cost housing to their membership. Many associations own buildings free-and-clear, and therefore are able to operate them on less revenue than can an owner who must make loan payments. Rents in buildings operated by nonprofit organizations are also usually lower than in privately owned buildings.

Rents for Vacant Units on the Market

Chinatown property managers and owners interviewed generally agree that typical rents for vacant hotel rooms are about $200 to $225 per month. Although vacancies among Chinatown apartments are rare, a property manager estimated that a studio apartment on today's market would rent for $450 and a one-bedroom for $550.

Turnover Rates

Chinatown rents are low in part because tenant turnover rates are low in the neighborhood. A property manager stated that Chinatown residential hotels experience a one percent turnover per year, and that apartments become vacant at an even slower pace. Although average tenure has declined recently, persons familiar with the area's housing market estimated that ten to fifteen years is a common term of occupancy.

Vacancy and Collection Loss

Vacancy rates are extremely low in Chinatown. The 3% vacancy factor used in the Chinatown prototypes was suggested by neighborhood property managers, and primarily reflects turnover and vacancy among commercial tenants.

TABLE III-1 RESIDENTIAL HOTEL RENTS - CHINATOWN

OCCUPIED UNITS		MONTHLY RENT ASSUMING 4% INCREASE PER YR (a)		
LOCATION	OWNER	1984	1985	1986
CLAY STREET	FAMILY ASSOC		30	31
CLAY STREET	PRIVATE		70-300	73-312
GRANT STREET	PRIVATE		81	84
KEARNY STREET	PRIVATE		89-219	93-228
#C-18 GRANT	NONPROFIT		109	113
#C-7	PRIVATE		110	114
#C-17 CLAY	NONPROFIT		113	118
#C-1 B'WAY/ COLUMBUS	PRIVATE		117	122
CITY SRO ORDINANCE PG.10	ALL	$118.50	123	128
COMMERCIAL ST.	NOT STATED		141	147
#C-12 GRANT/JACKSON	PRIVATE			155
#C-13 B'WAY @ COLUMBUS	NOT STATED			160
BROADWAY	PRIVATE		160-220	166-229
KEARNY STREET	PRIVATE		162-216	168-225
#C-22 BROADWAY	NONPROFIT			200
WASHINGTON	PRIVATE		194	202

(a) The first column in which a value is shown indicates actual datafor that year. Rents for occupied units are assumed to increase at 4% per year as allowed under San Francisco's rent control ordinance. Actual rents may be higher if vacancies occur.

SOURCE: Asian Neighborhood Design, 1985 survey; San Francisco City Planning Department, Residential Hotel Unit Conservation and Demolition Ordinance Status Report, 1985; and data collected by research team.

TABLE III-2 APARTMENT RENTS - CHINATOWN

OCCUPIED UNITS		MONTHLY RENT ASSUMING 4% INCREASE PER YR (a)		
LOCATION	OWNER	1984	1985	1986
STUDIOS				
#C-14 CLAY/STOCKTON	PRIVATE			300-800
#C-19 POWELL/CLAY	PRIVATE		189-200	197-208
ONE BEDROOM APTS.				
#C-3 GRANT NR SACRAMENTO	PRIVATE		144	150
#C-2 NR STOCKTON	FAMILY ASSOC		200-300	208-312
COMMERCIAL ST.	FAMILY ASSOC		204	212
MASON	NONPROFIT		217	226
SACRAMENTO ST.	PRIVATE		250	260
#C-14 CLAY/STOCKTON	PRIVATE			300-450
STUDIO OR ONE BEDROOM				
STOCKTON ST.	PRIVATE		100-302	104-314
#C-4 GRANT AVE.	FAMILY ASSOC		275	286
#C-6 JACKSON ST.	PRIVATE		264	275

(a) The first column in which a value is shown indicates actual datafor that year. Rents for occupied units are assumed to increase at 4% per year as allowed under San Francisco's rent control ordinance. Actual rents may be higher if vacancies occur.

SOURCE: Asian Neighborhood Design, 1985 survey, and data collected by research team.

TENDERLOIN

Rents for Currently Occupied Units

Table III-3 includes two estimates of the typical rent for currently occupied rooms in the Tenderloin. First, a 1984 study of residential hotel usage reported average rents of $227 per month in that year. Second, newspaper ads for vacant units in 1983 averaged $251 for Tenderloin hotel rooms. If these figures are increased at the rates allowed under rent control (7% from 1983 to 1984 and 4% annually thereafter), the estimated 1986 rent (for continuously occupied units) is $246 and $272 respectively.

Table III-4 shows that while many studio apartments rent for under $300 to long-term tenants, average studio rents are between $307 and $454. As shown in Table III-5 average rents for one bedroom apartments are $433 to $531. A number of one bedroom apartments with long-term tenants rent for below $350.

Rents for Vacant Units on the Market

Table III-3 includes several estimates of market-rate rents for residential hotel rooms. A telephone survey of 23 hotels in early 1986 found that the average rent for vacant units was $312 per month. A community organization familiar with housing in the area estimates that rooms with private baths currently rent for $380 to $420 per month, and that those without baths cost between $300 and $330. Finally, the Department of Social Services pays $7.50 to $15 per night, the equivalent of between $228 and $450 per month for hotel rooms for homeless clients.

Tenderloin apartment rents are shown in Tables III-4 and III-5. As indicated, market-rate rents for Tenderloin studios are currently $425 to $525. Vacant one-bedroom apartments in the neighborhood rent for between $500 and $675.

Turnover Rates

Because rent increases on vacant units are not limited by the current rent control law, the rate of tenant turnover has an important influence upon typical rents collected. Residential hotels serve both a transient population with typically short-term tenancy and also the elderly who are more likely to have remained in the same unit for several years. One management firm that handles a large number of Tenderloin area apartment buildings estimates that 25% of apartment units become vacant each year. The manager of a nonprofit residential hotel anticipates a 50% turnover each year.

Form of Ownership Influence on Rents

As indicated in Tables III-3 and III-4 nonprofit-owned buildings provide rooms and apartments at rents considerably below market rates. The typical residential hotel rent is under $200 per month in nonprofit buildings while studio apartments in these buildings rent for $300 to $335.

Vacancy and Collection Loss

Due to the neighborhood's higher rate of turnover, vacancy and collection losses are greater in the Tenderloin. Property managers report that vacancies have increased recently, and that current vacancy/loss factors are typically about five to six percent for Tenderloin area apartment buildings.

TABLE III-3 RESIDENTIAL HOTEL RENTS - TENDERLOIN

DATA SOURCE	OWNER	1986 RENT	NOTES
OCCUPIED UNITS			
TENDERLOIN TIMES CHRONICLE ADS SURVEY, 1983 = $235	PRIVATE	272	(a)
CITY SRO REPORT "NORTH OF MARKET," 1984 = $227	ALL	246	(a)
#T-21 POST/JONES	PRIVATE	407	(50% HAVE TRNSNT PERMIT)
#T-3	NONPROFIT	178	
COMMUNITY ORGANIZATION	NONPROFIT	185	
#T-2	NONPROFIT	364	INCL MEALS & MAID SVC.
VACANT UNITS			
DEPT. OF SOCIAL SVC. RATES	PRIVATE	228-450	$7.50 TO $15 PER DAY.
N.OF MARKET PLNG. COALITION	PRIVATE	300	MIN. W/O BA. MANY=320-330
N.OF MARKET PLNG. COALITION	PRIVATE	380-420	WITH BATH
TENDERLOIN TIMES PHONE SURVEY	PRIVATE	312	VACANT UNITS - 23 HOTELS
MANAGEMENT COMPANY	PRIVATE	295-300	"TYPICAL RENTS"

(a) 1986 rents are calculated by increasing the data year rent by the annual rate allowed under San Francisco's rent control ordinance.

SOURCE: San Francisco City Planning Department, Residential Hotel Unit Conservation and Demoliton Ordinance Status Report, 1985; Tenderloin Times rent survey, 1986; and data collected by research team.

TABLE III-4 STUDIO APARTMENT RENTS - TENDERLOIN

DATA SOURCE / LOCATION	OWNER	1986 RENT	NOTES
OCCUPIED UNITS			
TENDERLOIN TIMES SURVEY OF CHRONICLE ADS. 1983: $360 (a)	PRIVATE	417	
BROKER	PRIVATE	200-450	"TYPICAL RENTS"
BROKER	PRIVATE	320-460	"TYPICAL RENTS"
MANAGEMENT COMPANY	PRIVATE	375-400	"TYPICAL RENTS"
MANAGEMENT COMPANY	PRIVATE	395-425	"TYPICAL RENTS"
#T-26 LARKIN/TURK	PRIVATE	145-440	
#T-17 EDDY/LARKIN	PRIVATE	200-410	
MGMT CO. GEARY/HYDE	PRIVATE	232-475	
#T-22 EDDY/JONES	PRIVATE	235-500	
#T-20 O'FARRELL/LARKIN	PRIVATE	241-550	
#T-19 HYDE/O'FARRELL	PRIVATE	244-500	
#T-27 GEARY/LVNWTH	PRIVATE	247-420	BLDG AVG = 367
MGMT CO. LVNWRTH/SUTTER	PRIVATE	248-625	BLDG AVG = 454
MGMT CO. GEARY	PRIVATE	253-495	BLDG AVG = 333
#T-16 LVNWTH/GEARY	PRIVATE	255-375	
#T-12 GEARY/JONES	PRIVATE	255-400	BLDG AVG = 311
#T-18 O'FARRELL/JONES	PRIVATE	266-450	BLDG AVG = 359
#T-24 TURK/HYDE	PRIVATE	300-325	BLDG AVG = 310
#T-23 POST/LARKIN	PRIVATE	320-460	BLDG AVG = 358
#T-13 O'FARRELL/HYDE	PRIVATE	364-485	
#T-7 JONES/EDDY	PRIVATE	307	BLDG AVG = 307 W/UTIL
#T-6 O'FARRELL/HYDE	PRIVATE	381	BLDG AVG = 381 NO UTIL
#T-10 HYDE/O'FARRELL	PRIVATE	365	BLDG AVG = 365, PETITION
#T-1	NON-PROFIT	300	
#T-4	NON-PROFIT	304	
#T-5 ELLIS ST.	NON-PROFIT	341	
VACANT UNITS			
TENDERLOIN TIMES SURVEY OF UNITS FOR RENT	PRIVATE	442	AVERAGE FOR 78 VACANT UNITS LISTED APRIL '86(a)
MANAGEMENT COMPANY	PRIVATE	425-525	"TYPICAL RENTS"
BROKER	PRIVATE	450-525	400 IS LOWEST FOR VCNT ST
BROKER	PRIVATE	495-525	"TYPICAL RENTS"

(a) 1986 rents are calculated by increasing the data year rent by the annual rate allowed under San Francisco's rent control ordinance.

SOURCE: Tenderloin Times rent survey, 1986; and data collected by research team.

TABLE III-5 ONE-BEDROOM APARTMENT RENTS - TENDERLOIN

DATA SOURCE / LOCATION	OWNER	1986 RENT	NOTES
OCCUPIED UNITS			
BROKER	PRIVATE	200-450	"TYPICAL RENTS"
MANAGEMENT COMPANY	PRIVATE	425-600	"TYPICAL RENTS"
#T-12 GEARY/JONES	PRIVATE	400-450	BLDG AVG = 433
BROKER: GEARY	PRIVATE	285-660	BLDG AVG = 442
#T-11 HYDE/POST	PRIVATE	296-460	
#T-23 POST/LARKIN	PRIVATE	305-575	BLDG AVG = 460
#T-22 EDDY/JONESRY	PRIVATE	312-550	
#T-16 LVNWTH/GEARY	PRIVATE	313-499	
#T-17 EDDY/LARKIN	PRIVATE	350-475	
#T-26 LARKIN/TURK	PRIVATE	350-520	
MGMT CO. LVNWTH/ SUTTER	PRIVATE	362-650	BLDG AVG = 489
BROKER: GEARY	PRIVATE	413-600	BLDG AVG = 531
#T-27 GEARY/LVNWTH	PRIVATE	420-520	BLDG AVG = 480
#T-19 HYDE/O'FARRELL	PRIVATE	500	
#T-20 O'FARRELL/LARKIN	PRIVATE	650	
#T-8 POST/HYDE	PRIVATE	595	RENT PETITION
VACANT UNITS			
MANAGEMENT COMPANY	PRIVATE	575-675	"TYPICAL RENTS"
BROKER	PRIVATE	580-625	"TYPICAL RENTS"
BROKER	PRIVATE	500-600	"TYPICAL RENTS"

SOURCE: Data collected by research team.

BUSH STREET CORRIDOR

Rents for Currently Occupied and Market-Rate Units

As shown in Table III-6 typical rents for Bush Street occupied studio apartments range from $300 to $500. In contrast to currently vacant studios which have an asking price of $450 to $525, the rents that long-term tenants pay are generally below $395.

One-bedroom apartments along Bush Street average about $450 while vacant units are advertised at $625 and up. A management firm that handles a large number of buildings in the Tenderloin and along Bush Street estimates that in a average building, one-third of the units are currently rented at $150 to $200 less than market rates.

Turnover Rates

Property managers report a turnover rate of 25% per year in this area. As units are vacated, rents are generally raised to the market-rate levels described above.

Vacancy and Collection Loss

Vacancy rates have increased recently. Building managers estimate vacancy/loss factors to be about four percent in this area.

TABLE III-6   ROOM AND APARTMENT RENTS - BUSH STREET CORRIDOR

DATA SOURCE /LOCATION	OWNER	1986 RENT	NOTES
ROOMS			
#B-9 POST/JONES	PRIVATE	100-180	HOTEL
#B-12 POST/POLK	PRIVATE	150-340	HOTEL
#B-4 BUSH/JONES	PRIVATE	227-340	ROOMS IN APT. BLDG
MANAGEMENT CO.	PRIVATE	325-375	"TYPICAL RENT" FOR ROOM
STUDIOS - OCCUPIED			
#B-14 BUSH/JONES	PRIVATE	130-450	INDIVIDUAL METERS
#B-7 BUSH/HYDE	PRIVATE	175-281	
#B-11 LVNTH/POST	PRIVATE	224-500	INDIVIDUAL METERS
BROKER BUSH/TAYLOR	PRIVATE	247-485	BLDG AVG = 422 INDIV METER
#B-6 POST/POLK	PRIVATE	268-469	
#B-15 BUSH	PRIVATE	275-300	
#B-4 BUSH/JONES	PRIVATE	270-550	
MGMENT CO. BUSH ST.	PRIVATE	291-650	BLDG AVG = 497
#B-13 CALIF./HYDE	PRIVATE	296-450	INDIVIDUAL METERS
BROKER BUSH/HYDE	PRIVATE	308-442	BLDG AVG = 400 INDIV METER
MGMENT CO. BUSH ST.	PRIVATE	348-550	BLDG AVG = 460
JUNE 1986 SURVEY	PRIVATE	375-475	
MANAGEMENT COMPANY	PRIVATE	375-450	"TYPICAL RENT" 395 IS AVG
MGMENT CO. BUSH ST. BLDG.	PRIVATE	395-525	BLDG AVG = 457
MGMENT CO. BUSH ST. BLDG.	PRIVATE	395-650	BLDG AVG = 482
#B-10 BUSH	PRIVATE	512	PETITION SKS 530 FOR '86
STUDIOS - VACANT UNITS			
JUNE 1986 SURVEY	PRIVATE	440-500	AVG = 474
MANAGEMENT CO.	PRIVATE	450-600	
#B-4 BUSH/JONES	PRIVATE	525	
MANAGEMENT CO.	PRIVATE	450-525	
ONE BEDROOM APTS. - OCCUPIED			
MANAGEMENT CO.	PRIVATE	500-700	"TYPICAL RENTS"
#B-13 CALIF./HYDE	PRIVATE	208-600	SEPARATE METERS
JUNE 1986 SURVEY	PRIVATE	218-650	AVG = 444
#B-14 BUSH/JONES	PRIVATE	287-575	SEPARATE METERS
#B-7 BUSH/HYDE	PRIVATE	302-650	
#B-11 LVNWTH/POST	PRIVATE	303-340	SEPARATE METERS
#B-4 BUSH/JONES	PRIVATE	303-700	
ONE-BEDROOM - VACANT UNITS			
JUNE 1986 SURVEY	PRIVATE	625-800	AVG = 690
#B-4 BUSH/JONES	PRIVATE	630	

SOURCE: Data collected by research team.

B. COMMERCIAL RENT

CHINATOWN

As mentioned previously, income from commercial tenants provides a significant portion of total income for Chinatown buildings. The market-rate rent collected from business users offsets the low rents charged for residential units. The proportion of total revenue derived from commerical tenants is shown in Table III-7. As the table indicates, if buildings owned by non-profits are excluded, the percentage of total income that is received from commercial rents ranges from 45% to 80%. For the sample included in the table, the median value is 65%.

Several Chinatown real estate brokers explained that commercial rents in the neighborhood fall into the following three categories. Tourist-oriented shops and restaurants located along Grant Avenue between Bush and Washington command the highest rents, amounting to $4 to $7 per square foot for ground floor space. Local-serving businesses with locations on Grant north of Washington and along Stockton Street rent space for between $3 and $5 per square foot. Finally, commercial space along side streets typically rents at a per square foot rate of $2 to $4.

As in any market, commercial space above ground floor level is less expensive, and tenants generally pay proportionally less per square foot for large units than for small commercial spaces. According to one broker, typical commercial units are 800 to 1500 square feet. Tenants would pay less per square foot for units larger than this.

A real estate broker explained that Chinatown commercial rents have been fairly stable for the last several years and that most businesses sign three year leases, many of which include provisions for annual rent increases. In most cases commercial tenants pay for their own utilities; however, the owner typically pays the building's entire property tax and insurance bill.

According to a local community organization, nonprofit organizations that have commercial space for lease in their buildings generally rent to community-serving clients at below-market rates. In addition, family associations often rent commercial space to members at a somewhat reduced rent.

TENDERLOIN AND BUSH STREET AREAS

As in Chinatown, property location is a principal factor affecting commercial rent levels in these neighborhoods. Bush Street buildings located near Union Square can today command rents of about $4 per square foot. According to a management firm with property in the area, this rate has fallen from last year's rate of about $5 per square foot. On Bush Street West of Mason, commercial rents are currently between $1.25 and $2 per square foot. As indicated in Table III-8 Tenderloin rents average $1.10 to $1.25 per square foot.

As shown in Tables III-9 and III-10, the percentage of total income derived from commercial rents in the Tenderloin and Bush Street areas is considerably below the comparative figure for Chinatown. This is explained in part because buildings in these neighborhoods are taller and have a higher ratio of residential to ground-floor commercial space, and in part because residential rents in these areas are higher than in Chinatown.

Table III-7

CHINATOWN COMMERCIAL RENTS AS A PERCENTAGE OF TOTAL BUILDING INCOME

CASE #	INFO YEAR	OWNERSHP	BLDG TYPE	LOCATION	#RES UNITS	COMM UNITS	GROSS COMM INCOME	TOTAL GROSS INCOME	COMMERCIAL INC. AS A % OF TOTAL INC	MONTHLY COMM RENT /SPACE
C-1	1985	PRIVATE	HOTEL	B'WAY NR COL	20 RMS	2 FLR	$37,000	$65,000	57%	$1,542 /FLR
C-3	1985	PRIVATE	APTS	GRANT NR SAC	22 APT	4 UNITS	$75,500	$113,500	67%	$1,573 /UNIT
C-4	1985	FAM ASSOC	APTS	GRANT	20 APT	8 UNITS	$266,000 (a)	$332,000	80%	$2,771 /UNIT
C-6	1985	PRIVATE		JACKSON	12	5 UNITS	$72,000	$110,000	65%	$2,500 /UNIT $333 /UNIT
C-7	1985	PRIVATE	HOTEL	NOT STATED	44 RMS	4 STORES	$46,920	$105,000	45%	$878 /UNIT
C-8	1985	FAM ASSOC	RM&APT	STOCKTON	15	1 UNIT	$92,700	$135,000	69%	$7,725 /UNIT
C-9	1985	NT STATED	FLATS	WASH NR GRNT	2 FLATS	1FLR&BSM	$18,000	$23,200	78%	
C-12	1986	PRIVATE		GRANT @ JCK	83 RMS	360FT MZ	$36,000			$3,000 /MEZZ
						BANK	$108,000	$298,800	48%	$9,000 /BANK
C-13	1986	PRIVATE	HOTEL	BWAY @ COL	47 RMS	CLUB	$144,000 (b)	$234,000	62%	$12,000 /CLUB
C-16	1985	NONPROFIT	APTS	MASON	24 APT	2950 SQFT	$33,300 (c)	$107,984	31%	
C-17	1985	NONPROFIT	HOTEL	CLAY	82 RMS	3500 SQFT	$72,760 (c)	$192,334	38%	
C-18	1985	NONPROFIT	HOTEL	GRANT	34 RMS	2821 SQFT	$51,620 (c)	$96,473	54%	
C-22	1986	NONPROFIT	HOTEL	BROADWAY	65 RMS	5200 SQFT	$96,000 (c)	$252,610	38%	

(a) Owner occupies one floor.

(b) C-13 comm space is now vacant. Figure is broker's estimate.

(c) C-16, C-17, C-18 and C-22 are nonprofit-owned and charge below-market rates for both commercial and residential space.

Source: Data collected by research team.

TABLE III-8 COMMERCIAL RENTS PER SQUARE FOOT

INFO SOURCE	AREA	LOCATION	RENT PER SQUARE FOOT	COMMENTS
BROKER	BUSH	FRANKLIN	$1.25	HAS NOT RENTED AT $1.50
MANAGEMENT CO.	BUSH	NR UNION SQUARE	$4.00	$5 LAST YEAR
	BUSH	BUSH W.OF MASON	$2.00	$2.50 LAST YEAR
BROKER	TNDERLN		$1-1.35	
BROKER	TNDERLN		$1-1.10	GOING RATE FOR OCPD OR VACANT GROCERY STORE OR RESTAURANT SPACE
BROKER	TNDERLN	HYDE/LARKIN NR POLK	$1.10-1.25	
		HYDE/EDDY	$1.10-1.25	$1.50 MAX.
BROKER	TNDERLN	#T-19 HYDE/O'FARRL	$1.25	
CONSULTANT	CHINATOWN	GRANT -BUSH TO BWAY	$3-5	
		STKTON -WA TO VLLJO	$3-5	
		SIDE STREETS	$2-3	
BROKER	CHINATOWN	GRANT & STOCKTON	$3-5	
PROPERTY MGR	CHINATOWN	GRANT	$7	
		STOCKTON	$4	
		OFF GRANT	$3.50	
CONSULTANT	CHINATOWN	GRANT -BUSH TO WA	$4-9	
		STKTN, GRANT N OF WA	$3-4	
		SIDE STREETS	$2.50-4	

Source: Interviews conducted by research team.

TABLE III-9 BUSH STREET COMMERCIAL RENTS AS A PERCENTAGE OF TOTAL INCOME

CASE #	INFO YEAR	BLDG TYPE	LOCATION	#RES UNITS	COMM UNITS	GROSS COMM INCOME	TOTAL GROSS INCOME	COMMERCIAL INC. AS A % OF TOTAL INC	MONTHLY COMM RENT /SPACE
B-2	1988	APTS	BUSH/LVNTHWTH	21 APT	2 STORES	$30,000	$138,300	22%	$1,250 /STORE
B-5	1986	APTS	BUSH	13 APT	300 SQFT	$3,900	$52,980	7%	$325 /UNIT
B-9	1988	HOTEL	POST/JONES	25 RMS	1 STORE	$54,000	$96,000	56%	$4,500 /STORE
B-13	1986	APTS	CALIF/HYDE	12 APT	2 STORES	$9,180	$73,152	13%	UNIT $65 AND $700
B-12	1988	HOTEL	POST/POLK	22 RMS	1 STORE	$31,200	$108,000	29%	$2600/STORE
B-15	1986	APTS	BUSH	14 APT	1 UNIT	$3,800	$64,858	6%	$300/UNIT

SOURCE: Data collected by research team.

TABLE III-10 TENDERLOIN COMMERCIAL RENTS AS A PERCENTAGE OF TOTAL INCOME

CASE #	INFO YEAR	BLDG TYPE	LOCATION	#RES UNITS	COMM UNITS	GROSS COMM INCOME	TOTAL GROSS INCOME	COMMERCIAL INC. AS A % OF TOTAL INC	MONTHLY COMM RENT /SPACE
T-1	1986	APTS		32 APTS	1 UNIT	$11,540	$125,147	9%	$962 /UNIT
T-3	1988	HOTEL		40 RMS	2 UNITS	$20,362	$108,892	19%	$848 /UNIT
T-5	1988	APTS		42 APTS	2 UNITS	$31,095	$202,980	15%	$1,296 /UNIT
T-6	1986	APTS	O'FARRL @HYDE	49 APTS	1200 SQFT	$18,000	$241,776	7%	$1,500 /UNIT
T-7	1986	APTS	JONES@EDDY	50 APTS	2UNITS	$15,600	$199,680	8%	$650 /UNIT
T-14	1988	HOTEL	EDDY@LVNWTH	34 RMS	3 STORES	$40,000	$70,980	56%	$1,111 /STORE
T-15	1986	APTS	JONES @GEARY	5 APTS	1 BAR	$18,000	$45,960	39%	$1,500 /BAR
T-20	1986	APTS	O'FARL/LRKIN	41 APTS	3 UNITS	$28,800	$211,200	14%	$800 /STORE
T-22	1986	APTS	EDDY @ JONES	105 APTS	5 UNITS	$105,000	$566,980	19%	$1,750 /UNIT

SOURCE: Data Collected by research team.

IV. OPERATING EXPENSES

To develop the expense figures used in the prototypes, we used three measures: operating expense/income ratios, total annual operating expenses per unit, and line-item expenses for specific budget items such as management, insurance, utilities and maintenance.

Data sources included financial statements that property managers and building owners provided, detailed sales listings supplied by several brokers, and San Francisco Board of Realtors' Multiple Listings Service publications (MLS). Because the Multiple Listings generally include only a brief property description and because they frequently omit categories of expense, we analyzed this data source separately and primarily used it to gain comparative information on specific budget line items.

Interviews with property managers, brokers, and real estate investment firms supplemented the financial data. These interviews provided a valuable guide for the evaluation of building operating statements.

OPERATING EXPENSE/INCOME RATIOS

Operating expense/income ratios measure the percentage of annual revenue that is used to cover building operations. As is standard in real estate analysis, the "operating" expense budget does not include debt service or replacement reserves. The operating expense/income ratio is calculated by dividing total operating expenses by effective gross income (total income less vacancy/collection loss). When evaluating loan applications, banks usually assume that expenses equal 35% of effective gross income; however according to real estate brokers interviewed, the ratio can vary from 15 to 55% of income.

Property managers and owners interviewed for this study generally felt that the appropriate figure would fall within the 33 to 46 percent range. One appraiser suggested using 33-38% as an expense figure for older buildings. Because rents are below market rates, several persons familiar with buildings in the Chinatown area suggested using a 40% figure. A property management firm that handles many Tenderloin area properties suggested that 42% represents a minimum figure for buildings that are managed by professional firms. Another management firm was of the opinion that 33-35% would reflect a more accurate picture. Finally, because insurance costs for most buildings have at least doubled over 1985 rates, several persons interviewed stated that a 40 to 46 percent figure was not unrealistic.

It should be noted that the operating expense/income ratio is sensitive to several factors. First, if building rents are low, a larger percentage of income will be necessary to cover expenses. Second, because some items are fixed regardless of building size, the proportion of income used for operations may be larger for small buildings. In addition, particular line items vary by building and make comparisons difficult. For example, utility costs will vary by the type of heating system and by whether tenants pay for utilities. A major variable affecting overall operating expenses for residential hotels is the quantity of staff. Furthermore, the extent of deferred maintenance will affect the current repair and maintenance budget.

Table IV-1 shows the operating expense/income ratios for privately-owned apartment buildings in the three study neighborhoods. This table is based upon the non-MLS data displayed in Tables IV-4 through IV-6. The average ratios appear to fall on the high end of the range of figures that were suggested by the real estate professionals we interviewed. One explanation may be that the sample of buildings for which data could be obtained includes a large number of professionally managed and well-maintained buildings.

TABLE IV-1

OPERATING EXPENSE/EFFECTIVE GROSS INCOME -
APARTMENT BUILDINGS

NEIGHBORHOOD	LOW	HIGH	AVERAGE
Chinatown (a)	.14	.67	.44
Tenderloin	.40	.60	.48
Bush Street	.31	.73	.45

(a) Chinatown data is for 1985.

SOURCE: Data collected by research team.

ANNUAL OPERATING EXPENSES PER UNIT

Annual per-unit expense figures for privately-owned apartment buildings are shown in Table IV-2. This table also summarizes the non-MLS data from Tables IV-4 through IV-6, and indicates that on average annual expenses per unit for the buildings we studied generally fall within the $2000 to $2200 range that property managers recommended as a general guideline.

Expense data for Tenderloin and Chinatown residential hotels are shown in Tables IV-7 and IV-8.

TABLE IV-2

ANNUAL OPERATING EXPENSE PER RESIDENTIAL UNIT
FOR PRIVATELY-OWNED APARTMENT BUILDINGS

NEIGHBORHOOD	LOW	HIGH	AVERAGE
CHINATOWN (a)	$515	$3461	$1733 (b)
TENDERLOIN	$1592	$2407	$2081
BUSH STREET	$1455	$2760	$2073

(a) Chinatown building data is for 1985.

(b) One building showed $8000/unit annual expenses. This building is not included in the calculated averages.

SOURCE: Data collected by research team.

EXPENSE BUDGET LINE ITEMS

A third approach to the question of operating expenses involves comparing expenses for individual budget items. Table 2 in Section VI shows expenses per unit and per building for a range of expense items. As a supplement to this data, property managers and owners suggested the guidelines shown in Table IV-3.

Table IV-3 Operating Expense Budget Item Guidelines

BUDGET ITEM	SUGGESTED GUIDELINE
Management fees	4 to 6% of gross income
On-site management (salary & apt.)	$10-25 per unit per month
Payroll tax & fringe ben.	20% of on-site mgmt. expense
Legal, advertising, & accounting	$2500 per year or 11% of income
Water	$75 per unit per year
PG&E	$160 per unit per year
Insurance	$250 per unit per year
Property tax	1.11% of assessed value.
Maintenance	5 to 10% of gross income
Replacements	2% of gross
Total Expenses	$2000 - $2200 per unit

Source: Interviews conducted by research team.

Management Fees

According to several persons interviewed, managementfees of three to six percent of effective gross income are typical for privately-owned buildings. Because they charge reduced rents and therefore have less total income, non-profit owners generally attribute a higher percentage of income to management fees. Furthermore, because they often provide additional services and staff, nonprofit own-ers usually have higher management costs.

Insurance

Insurance on most buildings increased by 200 to 300 percent over 1985 levels. According to an insurance broker, rates for masonry apartment buildings range from $4 to $6 per $1000 of building replacement cost. The rate increases with building size and is higher for buildings that have commercial space. Coverage for residential hotels is difficult to obtain, and rates are substantially higher than for apartment buildings. Nonprofit owners are often required to obtain more extensive insurance coverage in order to comply with the terms of subsidized loan programs.

Property Tax

The 1986 tax rate was 1.14%. This has declined to 1.11% for the current fiscal year. For properties that have remained under the same ownership, increases in assessed valuation have been limited to 2% per year in accordance with Proposition 13 restrictions. Consequently, buildings

that have been under the same ownership for a long period face a lower tax bill than comparable buildings that have recently sold or changed ownership.

TABLE IV-4 TENDERLOIN OPERATING EXPENSES - APARTMENTS

CASE #	INFO SOURCE	INFO YEAR	OWNER	# RES UNITS	COMM. UNITS	TOTAL OPER EXP (OE)	OE/RES. UNIT/YR	EFFECTIVE GROSS INC (EGI)	OE/ EGI
T-1	CMTY ORG	1986	NONPROF	32	1 UNIT	83219	2684	120924	0.69
T-4	CMTY ORG	1986	NONPROF	48	NONE	113931	2374	168522	0.68
T-5	CMTY ORG	1986	NONPROF	42	2 UNITS	98324	2341	194861	0.50
T-6	MGMT. CO.	1986	PRIVATE	49	1 UNIT	107964	2203	233105	0.47
T-7	MGMT. CO.	1986	PRIVATE	50	2 UNITS	114204	2284	191612	0.60
T-12	BROKER	1986	PRIVATE	38		71250	1875	146300	0.49
T-13	MLS	1986	PRIVATE	33		42533	1289	159942	0.27
T-16	MLS	1986	PRIVATE	24		37317	1555	111891	0.33
T-17	MLS	1986	PRIVATE	34		41000	1206	148200	0.28
T-18	BROKER	1986	PRIVATE	26		61457	2364	116029	0.53
T-19	MLS	1986	PRIVATE	23	1 UNIT	35000	1522	107220	0.33
T-20	MLS	1986	PRIVATE	41	3 UNITS	78000	1902	228000	0.34
T-22	MLS	1986	PRIVATE	105	5 UNITS	251227	2393	529131	0.47
T-23	BROKER	1986	PRIVATE	64		135000	2109	341512	0.40
T-24	BROKER	1986	PRIVATE	20		36332	1817	73030	0.50
T-25	BROKER	1986	PRIVATE	36		57324	1592	131063	0.44
T-27	BROKER	1986	PRIVATE	35	42 UNITS	84250	2407	195988	0.43

SUMMARY - TENDERLOIN APARTMENTS

	AVERAGE EXPENSE PER UNIT PER YR.	AVERAGE OPER.EXP/EGI
MULTIPLE LISTINGS CASES	$1644	0.34
OTHER PRIVATELY OWNED	$2081	0.48
NONPROFIT OWNED	$2466	0.62

SOURCE: Data collected by research team.

TABLE IV-5

BUSH STREET CORRIDOR OPERATING EXPENSES - APARTMENTS

CASE #	INFO SOURCE	INFO YEAR	OWNER	# RES UNITS	COMM. UNITS	TOTAL OPER EXP (OE)	OE/RES. UNIT/YR	EFFECTIVE GROSS INC (EGI)	OE/ EGI
B-2	MGMT. CO.	1986	PRIVATE	21	2 UNITS	43500	2071	138300	0.31
B-3	MGMT. CO.	1986	PRIVATE	45	NONE	100000	2222	208000	0.48
B-4	WILSON	1986	PRIVATE	55	NONE	80000	1455	213144	0.38
B-5	MGMT. CO.	1986	PRIVATE	14	1 UNIT	38652	2761	52980	0.73
B-16	BROKER	1986	PRIVATE	39		73428	1883	177583	0.41
B-17	BROKER	1986	PRIVATE	24		49062	2044	127381	0.39
B-6	MLS	1986	PRIVATE	27		31350	1161	108577	0.26
B-7	MLS	1986	PRIVATE	16		20000	1250	66223	0.30
B-8	MLS	1986	PRIVATE	35	NONE	56511	1615	207890	0.27
B-11	MLS	1986	PRIVATE	10		9094	909	38589	0.24
B-13	MLS	1986	PRIVATE	12	2 STORES	16713	1393	69494	0.24
B-14	MLS	1986	PRIVATE	57		31142	546	252700	0.12
B-15	MLS	1986	PRIVATE	14		21799	1557	61423	0.35

SUMMARY - BUSH STREET CORRIDOR APARTMENTS

	AVERAGE EXPENSE PER UNIT PER YR.	AVERAGE OPER.EXP/EGI
MULTIPLE LISTINGS CASES	$1204	0.25
OTHER PRIVATELY OWNED	$2073	0.45

SOURCE: Data collected by research team.

TABLE IV-6

CHINATOWN OPERATING EXPENSES - APARTMENTS

CASE #	INFO SOURCE	INFO YEAR (a)	OWNERSHIP	# RES UNITS	COMM UNITS	TOTAL OPER EXP(OE)	OE/RES UNIT/ YEAR	EFFECTIVE GROSS INC (EGI)	OE/ EGI
C-2	MGMT. CO.	1985	FAM ASSOC	11	NONE	9200	836	26500	0.35
C-4	MGMT. CO.	1985	FAM ASSOC	20	8 UNITS	163000	8150	332000	0.49
C-8	MGMT. CO.	1985	FAM ASSOC	15	1 UNIT	18300	1220	135000	0.14
C-3	MGMT. CO.	1985	PRIVATE	22	4 STORES	45000	2045	113500	0.40
C-5	MGMT. CO.	1985	PRIVATE	13	VACANT	45000	3461	68000	0.66
C-6	MGMT. CO.	1985	PRIVATE	12	5 UNITS	19000	1583	110000	0.17
C-9	MGMT. CO.	1985	NOT STATED	2	GRND FLR	4600	2300	23200	0.20
C-10	MGMT. CO.	1985	PRIVATE	4	NONE	8400	2100	20500	0.41
C-11	MGMT. CO.	1985	PRIVATE	13	VACANT	6700	515	10073	0.67
C-21	RENT BD	1986	PRIVATE	17		26096	1535	72804	0.36
C-16	CMT. ORG.	1985	NONPROF	24	2950SQFT	40354	1681	107984	0.37

(a) With the exception of case #C-21, this table is based on 1985 data which has not been adjusted to reflect steep increases in insurance expense. As a result, this table cannot be readily compared to those for the Tenderloin and Bush Street areas.

SUMMARY - CHINATOWN APARTMENTS

	AVERAGE EXPENSE PER UNIT PER YR.	AVERAGE OPER.EXP/EGI
PRIVATELY OWNED (EXCL.C-4)	$1733	0.37

SOURCE: Data collected by research team.

TABLE IV-7

CHINATOWN OPERATING EXPENSES - RESIDENTIAL HOTELS

CASE #	INFO SOURCE	INFO YEAR (a)	OWNERSHIP	# RES UNITS	COMM UNITS	TOTAL OPER EXP(OE)	OE/RES UNIT/ YEAR	EFFECTIVE GROSS INC (EGI)	OE/ EGI
C-1	MGMT. CO.	1985	PRIVATE	20	2 COMM	17000	850	65000	0.26
C-7	MGMT. CO.	1985	PRIVATE	44	4 STORES	37500	852	105000	0.36
C-13	BROKER	1986	PRIVATE	47	CLUB	46428 (a)	988	224640	0.21
C-17	CMTY ORG	1985	NONPROF	82	3500SQFT	80017	976	192334	0.42
C-18	CMTY ORG	1985	NONPROF	34	2821SQFT	43140	1269	96473	0.45
C-22	CMTY ORG	1986	NONPROF	65	5200SQFT	113472	1746	252610	0.45

(a) C-13 DOES NOT INCLUDE MAINTENANCE & REPAIR; MAY BE LOW FIGURE FOR ADMINISTRATION.

SUMMARY - CHINATOWN RESIDENTIAL HOTELS

	AVERAGE EXPENSE PER UNIT PER YR.	AVERAGE OPER.EXP/EGI
PRIVATELY OWNED	$897	0.28
NONPROFIT OWNED	$1330	0.44

SOURCE: DATA COLLECTED BY RESEARCH TEAM.

TABLE IV-8

TENDERLOIN OPERATING EXPENSES - RESIDENTIAL HOTELS

CASE #	INFO SOURCE	INFO YEAR (a)	OWNERSHIP	# RES UNITS	COMM UNITS	TOTAL OPER EXP(OE)	OE/RES UNIT/ YEAR	EFFECTIVE GROSS INC (EGI)	OE/ EGI
T-2	CMTY ORG	1986	NONPROF	209	NONE	810046	3875	872813	0.93(a)
T-3	CMTY ORG	1986	NONPROF	40	CLUB, MKT	76190	1905	102147	0.75

(a) T-2 includes meals.

SOURCE: Data collected by research team.

V. DEBT SERVICE CHARACTERISTICS

The purpose of this section is to outline the purchase and finance assumptions used in the prototypes. Data on sales and mortgages were used to construct a model of the cost of purchasing and financing each of the URM prototypes developed. This model estimates sales prices and mortgage amounts for each prototype at five year intervals from 1971 through 1986 and calculates the current debt service for each scenario.

Length of Ownership

The rate of turnover of URM buildings provides information about the characteristics of URM building owners and about the type of debt service these buildings carry.

Records of building sales are kept by the City Assessor to levy transfer taxes and for reassessments. Research in the Assessor's records produced a list of sale dates for buildings in the target census tracts since 1968. The number of sales per year for each prototype is listed in Table V-1.

Purchase Prices

The Assessor's records provide sales prices since 1969 for all URMs in the target census tracts. These records were used to estimate a ?per unit price? for each prototype at each five-year interval. Per unit prices were used to determine a purchase price for the residential portion of each prototype. The portion of the purchase price attributed to commercial space was valued using a 10% capitalization of the annual commercial income. Commercial income for properties purchased prior to 1986 is estimated by deflating the 1986 commercial income by an annual deflation factor: 57% for 1981-1986, 7% for 1976-1980, and 5% for 1971-1975. (See Table V-2.)

Financing

The amount of debt service currently carried by URM owners is an important factor in evaluating the impact of additional debt required to finance seismic upgrades. Estimating mortgage amounts and terms in the target areas is very difficult, however, because financing in these neighborhoods is often obtained outside of the traditional financial institutions.

Financing calculations in this study are based upon conventional loan terms for multi-family buildings in the Bay Area. Purchases of buildings in the Tenderloin and on Bush Street were assumed to be financed with mortgages at 80% of the purchase price. Loan amounts in Chinatown were calculated at a lower loan-to-value ratio of 60% of the purchase price. Loans originated prior to 1980 are assumed to be fixed-rate, 30-year mortgages with savings and loan institutions. For buildings purchased in 1980 and after, mortgages are assumed to have a variable interest rate with a 15-year term and a 30-year amortization schedule.

Interest rates for mortgages at each five year interval are based on data from the Federal Home Loan Bank Board (FHLBB). For 1971 and 1976 the rate used is the Federal Home Mortgage Loan Corporation (FHLMC) average multifamily mortgage rate reported by the Federal Home Loan Bank Board. (See Table V-3.) Interest rates for the variable rate mortgages in 1981 and 1986 are calculated at 2.25% over the 11th District cost of funds in July of each year as reported by the FHLBB.

Analysis of debt service on URM buildings is complicated by the likelihood of secondary financing of these properties. Owners acting economically will "cash out" the equity built up in the property by assuming new debt or completely refinancing. This secondary financing activity is impossible to fit into the model because it varies with each building and owner. When and how much to refinance depends on each owner's financial status and investment strategy.

This model presents debt service scenarios for properties with mortgages obtained at the four purchase intervals. It is assumed that many, or for some prototypes, most of the longer-term owners will have refinanced or added additional debt since purchasing the building, and would therefore have a debt service closer to the 1986 financing scenario than that of the original purchase date. The uniqueness of each owner and building, however, make this activity impossible to model simply.

Table V-1: Number of Sales by Type and Location

	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
TENDERLOIN																				
Apartment	–	2	1	1	1	1	–	1	3	3	9	11	7	8	10	5	7	10	12	12
Hotel	1	3		–	–	–	5	1	4	1	2	1	2	4	5	8	4	3	7	1
CHINATOWN																				
Apartment	–	–	1	1	2	1	3	1	–	1	3	3	5	1	1	2	2	2	3	2
Hotel	–	–	1	–	2	–	2	3	1	2	2	4	2	4	1	1	1	1	–	–
BUSH STREET																				
Apartment	–	–	–	1	–	–	–	–	1	2	2	2	2	2	2	2	2	3	3	3

Table V-2: Estimated Purchase Price of URMs by Five Year Intervals

Prototype and Description	1971	1976	1981	1986
TENDERLOIN				
T-1 (100 rooms, 3500 sf commercial)	$525,400	$642,000	$1,369,200	$1,993,600
T-2 (40 apts., 0 sf Commercial)	$360,000	$600,000	$1,040,000	$1,600,000
T-3 (40 apts., 0 sf Commercial)	$360,000	$600,000	$1,040,000	$1,600,000
CHINATOWN				
C-1 (14 rooms, 1300 sf commercial)	$321,500	$425,200	$736,000	$9,972,50
C-2 (12 apts., 2150 sf commercial)	$395,300	$559,400	$759,900	$944,400
C-3 (48 rooms, 3100 sf commercial)	$555,800	$760,600	$1,545,000	$2,088,200
BUSH STREET				
B-1 (35 apts., 0 sf commercial)	$385,000	$490,000	$1,085,000	$1,575,000

Table V-3: Estimated Interest Rates

	1971	1976	1981	1986
Federal Home Loan Mortgage Corporation Average Multifamily Mortgage Rate (November)[a]	8.50%	9.65%		
Federal Home Loan Bank Board 11th District Cost of Funds (July)[b]			11.85%	7.50%
Variable Rate Spread over Index[c]			2.25%	2.25%
ESTIMATED INTERST RATE[d]	8.50%	9.50%	14.00%[e]	10.50%

[a] Federal Home Loan Bank Board Journal, December 1976 and December 1981.

[b] Federal Home Loan Bank of San Francisco.

[c] Survey of San Francisco banks and savings and loan institutions.

[d] Rounded estimate of given rates.

[e] Because the 1981 mortgage is a variable rate loan, we use 1986 interst rates to calculate current debt service payables.

Chinatown Residential Hotels (Prototypes C-1 and C-3)

Residential buildings in Chinatown are generally in long-term ownership. On average, only one Chinatown URM residential hotel has been sold per year since 1979, and only one building has sold in the last three years.

Purchase prices for this prototype have increased from $7,000 per room in 1971 to $33,000 per room in 1986. Mortgages in Chinatown are estimated in this study at 60% of the purchase price rather than 80% as in the other neighborhoods, due to the very low rents in these buildings.

Due to the long-term nature of ownership in Chinatown, prototype C-1 most likely has no debt service (mortgage paid off) or low debt service (due to a comparatively low purchase price in the 1960's or 1970's).

Table V-4: Debt Service Calculation: Prototype C-1

Year of Purchase		1971	1976	1981	1986
Price per Room (14 rooms)		$7,000	$10,000	$24,000	$33,000
TOTAL RESIDENTIAL PRICE		$98,000	$140,000	$336,000	$462,000
Commercial space (square feet)		1,300	1,300	1,300	1,300
Annual Deflation Factor	(1)	5.0%	7.0%	5.0%	--
TOTAL COMMERCIAL PRICE		$223,500	$285,200	$400,000	$510,000
TOTAL PURCHASE PRICE		$321,5000	$425,2000	$736,000	$972,500
Maximum Loan/Value Ratio		60%	60%	60%	60%
Maximum Debt Coverage Ratio		1.15	1.15	1.15	1.15
MORTGAGE AMOUNT	(2)	$192,900	$255,100	$441,600	$444,000
% of Purchase Price		60%	60%	60%	46%
Interest Rate	(3)	8.50%	9.50%	9.75%	9.75%
Amortization Period	(4)	30 yrs	30 yrs	30 yrs	30yrs
Current Debt Service		$17,799	$25,740	$45,528	$45,776

---

(1) Commercial portion is valued by capitalizing income at a 10% rate. Pre 1986 commercial income is estimated by deflating the 1986 rents by the annual deflation factor shown for each five-year interval.

(2) Mortgage amount is calculated as the lesser of a 60% loan-to-value ratio or 1.5% debt coverage ratio.

(3) Rates for 1981 and 1986 mortgages are variable. Current debt service is calculated at 1986 rates.

(4) 1981 and 1986 mortgages are 15-year loans with a 30-year amortization schedule.

Due to the availability of low- and no-interest financing for nonprofits, a nonprofit owner of this prototype was estimated to have financed a maximum of 40% of the total purchase price at market rates. The result is a substantially lower debt service.

Table V-5: Debt Service Calculation: Prototype C-3

Year of Purchase		1971	1976	1981	1986
Price per room (48 rooms)		$7,000	$19,000	$24,000	$33,000
TOTAL RESIDENTIAL PRICE		$336,000	$480,000	$1,152,000	$1,584,000
Commercial space (square feet)		3,100	3,100	3,100	3,100
Annual Deflation Factor	(1)	5.0%	7.0%	5.0%	---
TOTAL COMMERCIAL PRICE		$219,000	$280,600	$393,000	$502,200
TOTAL PURCHASE PRICE		$555,800	$760,600	$1,545,500	$2,086,200
Maximum Loan/Value Ratio		40%	40%	40%	40%
Maximum Debt Coverage Ratio		1.15	1.15	1.15	1.15
MORTGAGE AMOUNT	(2)	$222,320	$304,200	$456,600	$414,100
% of Purchase Price		40%	40%	20%	20%
Interest Rate	(3)	8.50%	9.50%	9.75%	.75%
Amortization Period	(4)	30 yrs	30 yrs	30 yrs	30 yrs
Current Debt Service		$20,513	$30,695	$31,868	$42,693

---

(1) Commercial portion is valued by capitalizing income at a 10% rate. Pre 1986 commercial income is estimated by deflating the 1986 rents by the annual deflation factor shown for each five-year interval.

(2) Mortgage amount is calculated as 40% or less of the purchase price based on actual cases.

(3) Rates for 1981 and 1986 mortgages are variable. Current debt service is calculated at 1986 rates.

(4) 1981 and 1986 mortgages are 15-year loans with a 30-year amortization schedule.

Chinatown Apartments Prototype C-2

The low rate of turnover in Chinatown residential buildings suggests that this prototype probably has no debt service (mortgage paid off) or low debt service (purchased in late 1960's/early 1970's). The per-unit price for apartments in Chinatown has increased from $16,000 in 1971 to $40,000 in 1986.

Table V-6: Debt Service Calculation: Prototype C-2

Year of Purchase		1971	1976	1981	1986
Price per unit (12 units)		$16,000	$25,000	$33,000	$40,000
TOTAL RESIDENTIAL PRICE		$192,000	$300,000	$396,000	$480,000
Commercial space (square feet)		2,150	2,150	2,150	2,150
Annual Deflation Factor	(1)	5.0%	5.0%	5.0%	5.0%
TOTAL COMMERCIAL PRICE		$203,300	$259,400	$363,900	$464,400
TOTAL PURCHASE PRICE		$395,300	$559,400	$759,900	$944,400
Maximum Loan/Value Ratio		60%	60%	60%	60%
Maximum Debt Coverage Ratio		1.15	1.15	1.15	1.15
MORTGAGE AMOUNT	(2)	$237,200	$335,600	$455,900	$453,300
% of Purchase Price		60%	60%	60%	48%
Interest Rate	(3)	8.50%	9.50%	9.75%	9.75%
Amortization Period	(4)	30 yrs	30 yrs	30 yrs	30 yrs
Current Debt Service		$21,886	$33,863	$47,003	$46,735

---

(1) Commercial portion is valued by capitalizing income at a 10% rate. Pre-1986 commercial income is estimated by deflating the 1986 rents by the annual deflation factor shown for each five-year interval.

(2) Mortgage amount is calculated as the lesser of a 60% loan-to-value ratio or 1.5% debt coverage ratio.

(3) Rates for 1981 and 1986 mortgages are variable. Current debt service is calculated at 1986 rates.

(4) 1981 and 1986 mortgages are 15-year loans with a 30-year amortization schedule.

Bush Street Apartments (Prototype B-1)

Bush Street URM apartment buildings have sold at a steady pace of 1-3 buildings per year since 1975, after a period of very little sales activity in the early 1970's. Purchase prices have increased from $11,000 per unit in 1971 to $45,000 per unit in 1986.

A mortgage at 80% of the estimated 1986 purchase price would result in annual debt service figures that produce a substantial negative cash flow. This suggests that recent buyers are willing to pay a higher amount than the current rents support in anticipation that rents will increase significantly in these buildings in the near future.

Table V-7: Debt Service Calculation: Prototype B-1

Year of Purchase	1971	1976	1981	1986
Price per Apartment (35 Units)	$11,000	$14,000	$31,000	$45,000
TOTAL RESIDENTIAL PRICE	$385,000	$490,000	$1,085,000	$1,575,000
Commercial space (square feet)	0	0	0	0
Annual Deflation Factor (1)	5.0%	5.0%	5.0%	5.0%
TOTAL COMMERCIAL PRICE	$0	$0	$0	$0
TOTAL PURCHASE PRICE	$385,000	$490,000	$1,085,000	$1,575,000
Maximum Loan/Value Ratio	80%	80%	80%	80%
Maximum Debt Coverage Ratio	1.15	1.15	1.15	1.15
MORTGAGE AMOUNT (2)	$308,000	$392,000	$868,000	$1,000,000
% of Purchase Price	80%	80%	80%	63%
Interest Rate (3)	8.50%	9.50%	9.75%	9.75%
Amortization Period (4)	30 yrs	30 yrs	30 yrs	30 yrs
Current Debt Service	$28,419	$39,554	$89,490	$103,099

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(1) Commercial portion is valued by capitalizing income at a 10% rate. Pre-1986 commercial income is estimated by deflating the 1986 rents by the annual deflation factor shown for each five-year interval.

(2) Mortgage amount is calculated as the lesser of a 80% loan-to-value ratio or 1.5% debt coverage ratio.

(3) Rates for 1981 and 1986 mortgages are variable. Current debt service is calculated at 1986 rates.

(4) 1981 and 1986 mortgages are 15-year loans with a 30-year amortization schedule.

Tenderloin Residential Hotels (Prototype T-1)

Fifty-three percent of the sales of Tenderloin URM residential hotels have taken place since 1980. The pur-chase price per room calculated for this type of building has increased from under $4,000 per room in 1971 to $16,500 per room in 1986.

Table V-8: Debt Service Calculation: Prototype T-1

Year of Purchase	1971	1976	1981	1986
Price per Room (100 rooms)	$3,750	$4,500	$11,000	$16,500
TOTAL RESIDENTIAL PRICE	$375,00	$450,000	$1,100,000	$1,650,000
Commercial space (square feet)	3,500	3,500	3,500	3,500
Annual Deflation Factor (1)	5.0%	7.0%	5.0%	---
TOTAL COMMERCIAL PRICE	$150,400	$192,000	$269,200	$343,600

TOTAL PURCHASE PRICE		$525,400	$642,000	$1,369,200	$1,993,600
Maximum Loan/Value Ratio		80%	80%	80%	80%
Maximum Debt Coverage Ratio		1.15	1.15	1.15	1.15
MORTGAGE AMOUNT	(2)	$420,320	$513,600	$1,095,460	$1,594,880
% of Purchase Price		80%	80%	80%	80%
Interest Rate	(3)	8.50%	9.50%	9.75%	9.75%
Amortization Period	(4)	30 yrs	30 yrs	30 yrs	30 yrs
Current Debt Service		$38,783	$51,824	$112,930	$164,430

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(1) Commercial portion is valued by capitalizing income at a 10% rate. Pre-1986 commercial income is estimated by deflating the 1986 rents by the annual deflation factor shown for each five-year interval.

(2) Mortgage amount is calculated as the lesser of a 80% loan-to-value ratio or 1.5% debt coverage ratio.

(3) Rates for 1981 and 1986 mortgages are variable. Current debt service is calculated at 1986 rates.

(4) 1981 and 1986 mortgages are 15-year loans with a 30-year amortization schedule.

Tenderloin Apartments (Prototype T-2)

Sales of apartment buildings in the Tenderloin have been frequent, with an average of nine sales per year since 1977 and eleven per year in the last three years. The purchase price per unit ranges from $9,000 in 1971 to $40,000 in 1986.

Table V-9: Debt Service Calculation: Prototype T-2

Year of Purchase		1971	1976	1981	1986
Price per Unit (40 units)		$9,000	$15,000	$26,000	$40,000
TOTAL RESIDENTIAL PRICE		$360,000	$600,000	$1,040,000	$1,600,000
Commercial space (square feet)		0	0	0	0
Annual Deflation Factor		5.0%	7.0%	5.0%	---
TOTAL COMMERCIAL PRICE		$0	$0	$0	$0
TOTAL PURCHASE PRICE	(1)	$360,000	$600,000	$1,040,000	$1,600,000
Maximum Loan/Value Ratio		80%	80%	80%	80%
Maximum Debt Coverage Ratio		1.15	1.15	1.15	1.15
MORTGAGE AMOUNT	(2)	$288,000	$480,000	$832,000	$822,700
% of Purchase Price		80%	80%	80%	51%
Interest Rate	(3)	8.50%	9.50%	9.75%	9.75%
Amortization Period	(4)	30 yrs	30 yrs	30 yrs	30 yrs
Current Debt Service		$26,574	%48,433	$85,778	$84,819

(1) Commercial portion is valued by capitalizing income at a 10% rate. Pre-1986 commercial income is estimated by deflating the 1986 rents by the annual deflation factor shown for each five-year interval.

(2) Mortgage amount is calculated as the lesser of a 80% loan-to-value ratio or 1.5% debt coverage ratio.

(3) Rates for 1981 and 1986 mortgages are variable. Current debt service is calculated at 1986 rates.

(4) 1981 and 1986 mortgages are 15-year loans with a 30-year amortization schedule.

Due to the availability of low- and no-interest financing for non-profits, a non-profit owner of this prototype was estimated to have financed a maximum of 40% of the total purchase price at market rates. The result is a substantially lower debt service.

Table V-10: Debt Service Calculation: Prototype T-3

Year of Purchase		1971	1976	1981	1986
Price per Unit (40 units)		$9,000	$15,000	$26,000	$40,000
TOTAL RESIDENTIAL PRICE		$360,000	$600,000	$1,040,000	$1,600,000
Commercial space (square feet)		0	0	0	0
Annual Deflation Factor		5.0%	7.0%	5.0%	---
TOTAL COMMERCIAL PRICE		$0	$0	$0	$0
TOTAL PURCHASE PRICE	(1)	$360,000	$600,000	$1,040,000	$1,600,000
Maximum Loan/Value Ratio		40%	40%	40%	40%
Maximum Debt Coverage Ratio		1.15	1.15	1.15	1.15
MORTGAGE AMOUNT	(2)	$144,000	$240,000	$416,000	$506,000
% of Purchase Price		40%	40%	40%	31%
Interest Rate	(3)	8.50%	9.50%	9.75%	9.75%
Amortization Period	(4)	30 yrs	30 yrs	30 yrs	30 yrs
Current Debt Service		$13,287	$24,217	$42,889	$51,766

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(1) Nonprofit agency is assumed to receive subsidy towards the purchase price and to syndicate tax benefits to limited partners.

(2) Mortgage amount is calculated as 40% or less of the purchase price based on actual cases.

(3) Rates for 1981 and 1986 mortgages are variable. Current debt service is calculated at 1986 rates.

(4) 1981 and 1986 mortgages are 15-year loans with a 30-year amortization schedule.

VI. CASE STUDIES

This section displays cash flow statement summaries for actual buildings in Chinatown, the Tenderloin and the Bush Street Corridor. The information included in these statements was obtained from income and expense statements provided by property owners and managers, petitions filed with the San Francisco Residential Rent Stabilization Board, detailed sales listings provided by real estate brokers, and listings published in the San Francisco Board of Realtors' Multiple Listings Service. These cases were used to develop both the prototypes that appear in Section I and the tables shown in Sections II through V.

Following the case studies, Table VI-2 shows a detailed breakdown of operating expenses on a per unit and per building basis for those case studies that included such information.

TABLE VI-1 CASE STUDY CASH FLOW STATEMENTS

CASE# - INFO YR	#C-1 - 1985	#C-2 - 1985	#C-3 - 1985
INFO SOURCE	MGMT. CO	MGMT. CO.	MGMT. CO.
NEIGHBORHOOD	Chinatown	Chinatown	Chinatown
ADDRESS	Broadway nr. Columbus	Nr. Stockton	Grant nr. Sacramento
OWNERSHIP	private	family association	private
BLDG TYPE	hotel w/commercial	apartments	apartments w/comm.
STRUCTURE	brick	brick	brick
# STORIES	hill 3-4	3 + basement	3 + basement
# RES UNITS	20 rooms, 2 floors cmty bath & kitchen	11 (4-ST, 7-1BR)	22 (3 room units)
COMMERCIAL	two floors; hill	none	four comm. spaces
GROSS INC RES	$28,000	$26,500	$38,000
GROSS INC COMM	$37,000	n/a	$75,500
TOTAL GROSS INC	$65,000	$26,500	$113,500
VACANCY/LOSS	(*)	(*)	(*)
EFF. GR. INC.	$65,000	$26,500	$113,500
OPER. EXPENSES	$17,000	$9,200	$45,000
NOI	$48,000	$17,300	$68,500
DEBT SERVICE	$19,500	none	none
BTCF	$28,500	$17,300	$68,500
NOTES	Close to no debt. Balance = $15,000. Loan is probably 7-8 years old. Prob. was 50-60% down. (*) Income figures are effective inc.	Rents are 50% below market value. One BR apts are $200 to 300 per month. Income figures are effec. inc.	Units are worth $500/month. Very large bldg. Long-term ownership. Income figures are effective income.
AVG RNT/UNIT/MO	$117	$201	$144
AVG EXP/UNIT/YR	$850	$836	$2,045
OP.EXP / EGI	0.26	0.35	0.40
NOI/DEBT SVC	2.46		

CASE# - INFO YR	#C-4 - 1985	#C-5 - 1985	#C-6 - 1985
INFO SOURCE	MGMT. CO.	MGMT. CO	MGMT. CO.
NEIGHBORHOOD	Chinatown	Chinatown	Chinatown
ADDRESS	Grant Ave.	Pacific nr. Powell	Jackson
OWNERSHIP	family association	private	private
BLDG TYPE	apts., elevator	apartments	
STRUCTURE	brick	wood frame	brick
# STORIES	hill 4-5	3-4	3 + partial basement
# RES UNITS	20 (ST & 1 BR)	13 (1-BR)	12
COMMERCIAL	8 comm units	ground flr. vacant	5 comm. spaces
GROSS INC RES	$66,000	$68,000	$38,000
GROSS INC COMM	$266,000	n/a	$72,000
TOTAL GROSS INC	$332,000	$68,000	$110,000
VACANCY/LOSS	(*)	(*)	(*)
EFFEC. GR. INC.	$332,000	$68,000	$110,000
OPER. EXPENSES	$163,000	$45,000	$19,000
NOI	$169,000	$23,000	$91,000
DEBT SERVICE	$89,200	$16,600	$25,000
BTCF	$79,800	$6,400	$66,000
NOTES	Assoc. occupies one floor - ofc & mtg rm. No rent for these. Loan is "substantial. Taken out c. 5 yrs. ago for remodelling. (*) Income figures are effec. income.	(*) Income figures are effec. income. Loan balance is $117,000.	Two comm. spaces rent for $5000/mo. Three rent for $333/month. Alley vs. front St. Also low ceiling. Loan balance is $205,000. Income is effec. inc.
AVG RNT/UNIT/MO	$275	$436	$264
AVG EXP/UNIT/YR	$8,150	$3,461	$1,583
OP.EXP / EGI	0.49	0.66	0.17
NOI/DEBT SVC	1.89	1.39	3.64

CASE# - INFO YR	#C-7 - 1985	#C-8 - 1985	#C-9 - 1985
INFO SOURCE	MGMT. CO.	MGMT. CO.	MGMT. CO.
NEIGHBORHOOD	Chinatown	Chinatown	Chinatown
ADDRESS		Stockton	Washington nr. Grant
OWNERSHIP	private	family association	
BLDG TYPE	Res. Hotel	Rooms & apts.	Comm. & 2 flats
STRUCTURE	brick	brick	brick
# STORIES	3	4	3
# RES UNITS	44 rooms	15 (Rooms & sm. apts)	2 flats
COMMERCIAL	4 stores	1 comm. space	ground flr. & basemnt
GROSS INC RES	$58,080	$42,300	$5,200
GROSS INC COMM	$46,920	$92,700	$18,000
TOTAL GROSS INC	$105,000	$135,000	$23,200
VACANCY/LOSS	(*)	(*)	(*)
EFFEC. GR. INC.	$105,000	$135,000	$23,200
OPER. EXPENSES	$37,500	$18,300	$4,600
NOI	$67,500	$116,700	$18,600
DEBT SERVICE	$17,000	none	none
BTCF	$50,500	$116,700	$18,600
NOTES	Large bldg. Income figures are effective inc.	Two stories and one comm. space used by Association. Income figures are effective inc.	Income figures are effective inc.
AVG RNT/UNIT/MO	$110	$235	$217
AVG EXP/UNIT/YR	$852	$1,220	$2,300
OP.EXP / EGI	0.36	0.14	0.20
NOI/DEBT SVC	3.97		

CASE# - INFO YR	#C-10 - 1985	#C-11 - 1985	#C-12 - 1986
INFO SOURCE	MGMT. CO.	MGMT. CO.	BROKER
NEIGHBORHOOD	Chinatown	Chinatown	Chinatown
ADDRESS	Washington nr. Powell	Washington nr. Powell	Grant @ Jackson Bank of Trade Bldg.
OWNERSHIP	private	private	private
BLDG TYPE	flats	apartments	SRO, bank, retail
STRUCTURE	wood frame	wood frame	reinf. concrete
# STORIES			4 + mezz. + bsment
# RES UNITS	4 flats	13 (9-ST, 4-1BR)	83 rooms
COMMERCIAL	none	vacant	see notes
GROSS INC RES	$20,500	$10,073	$154,800
			retail 36,000
GROSS INC COMM	n/a	none	bank $108,000
TOTAL GROSS INC	$20,500	$10,073	$298,800
VACANCY/LOSS	(*)	(*)	11,952
EFFEC. GR.INC.	$20,500	$10,073	$286,848
OPER. EXPENSES	$8,400	$6,700	***util $23,760
			***ins. 11,600
NOI	$12,100	$3,373	
DEBT SERVICE	none	none	
BTCF	$12,100	$3,300	
NOTES	Income figures are effective income.	Income figures are effective income.	Bank occ. entire grnd flr; lot is 69x69. Retail on mezz: 12x30 Util. is for SRO; ins whole bldg. Comm. pay util & pt. of proptex Bldg. recently sold for $4.065 mill.
AVG RNT/UNIT/MO	$427	$65	155
AVG EXP/UNIT/YR	$2,100	$515	
OP.EXP / EGI	0.41	0.67	
NOI/DEBT SVC			

CASE# - INFO YR	#C-13 - 1986	#C-14 - 1986	#C-15 - 1986
INFO SOURCE	BROKER	MLS	MLS
NEIGHBORHOOD	Chinatown	Chinatown	Chinatown
ADDRESS	B'way @ Columbus	Clay @ Stockton	Tracy / Vallejo
OWNERSHIP			
BLDG TYPE	Rooms & nightclub	Apt. & Comm.	Apts.
STRUCTURE	wood frame	reinf.concr;brick ext	wood frame
# STORIES	4	3	3
# RES UNITS	47 rooms 6 toilets, 3 showers	7 (2-ST, 1-1BR, 1-2BR 1-3BR)	3
COMMERCIAL	vacant nightclub	2 comm. units	none
GROSS INC RES	$90,000		$24,120
GROSS INC COMM	est. $144,000		n/a
TOTAL GROSS INC	$234,000	$50,000	$24,120
VACANCY/LOSS	9,360		
EFFEC. GR. INC.	$224,640		
OPER. EXPENSES	$46,428		info not. avail.
NOI	$178,212		
DEBT SERVICE	info not avail.	info not avail.	info not avail.
BTCF			
NOTES	Currently for sale. Exp: $4200-mgr; 20,280-ins; 2640-H2o; 6000-PG&E; 240-phone; More expenses.	Lot 34x37. Up to seis code. Nu roof. paint floors, carpt. Rents: ST: 300-800 1BR: 300-450; 2BR: 175-475; 3BR: 800-1000.	Built in 1911. Rents: 3BR: $800 & $630; 2BR: $580.
AVG RNT/UNIT/MO	$160		$670
AVG EXP/UNIT/YR	$988		
OP.EXP / EGI	0.21		
NOI/DEBT SVC			

CASE# - INFO YR	#C-18 - 1985	#C-17 - 1985	#C-18 - 1985
INFO SOURCE	CMTY. ORG.	CMTY. ORG.	CMTY. ORG.
NEIGHBORHOOD	Chinatown	Chinatown	Chinatown
ADDRESS	Mason	Clay	Grant
OWNERSHIP	Non-profit	Non-profit	Non-profit
BLDG TYPE	apartments	SRO w/storefront	SRO w/ comm.
STRUCTURE	wood frame	reinf. concrete	wood frame
# STORIES	4	4 + basement	3 + basement
# RES UNITS	24 apts (8850 sqft)	82 (10,800 sqft)	34 (7360 sqft)
COMMERCIAL	2950 sqft	3500 sqft	2821 sqft
GROSS INC RES	$62,532	$110,989	$44,470
	***OTHER 12,153	***OTHER 8,585	***OTHER 383
GROSS INC COMM	$33,300	$72,760	$51,820
TOTAL GROSS INC	$107,984	$192,334	$98,473
VACANCY/LOSS	(*)	(*)	(*)
EFFEC. GR. INC.	$107,984	$192,334	$96,473
OPER. EXPENSES	$40,354	$80,017	$43,140
NOI	$87,630	$122,812	$53,333
DEBT SERVICE	$54,634	$94,344	$49,880
BTCF	$18,415	$28,268	$3,673
NOTES	Debtsvc: 39220-"mtg int,"15414-rehab. Exp does not incl admin. Mgr. gets free rent, no salary. Other inc is interest. (*) Income figures are effective inc.	Doesn't incl admin. expense. Debt svc: 69,996= "mtg intst," 24,348= rehab. Other inc: 6130 intst 959-coin mech., (*) Income figures are effective inc.	Other inc is intst & misc. Debt svc is mortgage interest." No management fee. (*) Income figures are effective inc.
AVG RNT/UNIT/MO	$217	$113	$109
AVG EXP/UNIT/YR	$1,681	$976	$1,269
OP.EXP / EGI	0.37	0.42	0.45
NOI/DEBT SVC	1.24	1.19	1.07

CASE# - INFO YR	#C-19 1984	#C-20 1983	#C-21 1986
INFO SOURCE	Rent Board	Rent Board	Rent Board
NEIGHBORHOOD	Chinatown	Chinatown	Chinatown
ADDRESS	Powell/Clay/Sacto	Pacific/Powell	Mason/Sacto
OWNERSHIP	private	private	private
BLDG TYPE	apts	apts	apts
STRUCTURE			
# STORIES	3	3+bsmnt	4
# RES UNITS	15 (2.4 rm avg)	6 (4rm avg)	17 (2 rm avg)
COMMERCIAL			
GROSS INC RES			$72,804
GROSS INC COMM			
TOTAL GROSS INC			$72,804
VACANCY/LOSS			2,912
EFFEC. GR. INC.			$69,892
OPER. EXPENSES	$15,723	$6,500	$26,096
NOI			$43,796
DEBT SERVICE	$30,369	none	info not available
BTCF			
NOTES	Seeks incr for 10 apt from avg '84 rent: $179 to avg 1985 rent $191.	Avg 1983 rents on 4 units = $335. Incr sought for '84 to $359.	Avg rent is for '86. Seeks incr to avg $446.
AVG RNT/UNIT/MO	see note above	see note above	$433
AVG EXP/UNIT/YR	$1,048	$1,083	$1,535
OP.EXP / EGI			0.37
NOI/DEBT SVC			

CASE# - INFO YR	#C-22 1986
INFO SOURCE	CMTY ORG.
NEIGHBORHOOD	Chinatown
ADDRESS	Broadway
OWNERSHIP	Non-Profit
BLDG TYPE	SRO
STRUCTURE	
# STORIES	3
# RES UNITS	65
COMMERCIAL	5200 SQ.FT.
GROSS INC RES	$155,610*
OTHER	$1,000
GROSS INC COMM	$96,000*
TOTAL GROSS INC	$252,610
VACANCY/LOSS	*
EFFEC. GR. INC.	$252,610
OPER. EXPENSES	$113,472
NOI	$139,138
DEBT SERVICE	$110,892
BTCF	$28,246
NOTES	* Income figures are effective income. Vacancy factor already included.
AVG RNT/UNIT/MO	$200
AVG EXP/UNIT/YR	$1,746
OP.EXP / EGI	0.45
NOI/DEBT SVC	1.25

CASE# - INFO YR	#T-1 - 1988	#T-2 1988	#T-3 - 1986
INFO SOURCE	CMTY. ORG.	CMTY. ORG.	CMTY. ORG.
NEIGHBORHOOD	Tenderloin	Tenderloin	Tenderloin
ADDRESS			
OWNERSHIP	non-profit	non-profit	non-profit
BLDG TYPE	apts w/commercial	hotel	hotel
STRUCTURE			
# STORIES			
# RES UNITS	31 ST, 1-BR	209 ROOMS	40 ROOMS
COMMERCIAL	1 SPACE @ $1/SQFT	NONE	CLUB, STORE
GROSS INC RES	$111,301	$913,885	$85,404
OTHER	$2,306	$21,240	$2,926
GROSS INC COMM	$11,540	N/A	$20,382
TOTAL GROSS INC	$125,147	$935,125	$108,892
VACANCY/LOSS	-4,223	-62,312	-6,545
EFFEC. GR. INC.	$120,924	$872,813	$102,147
OPER. EXPENSES	$83,219	$810,046	$79,190
NOI	$37,705	$62,787	$25,957
DEBT SERVICE	$27,052	$31,903	NONE
BTCF	$10,653	$30,864	$25,957
NOTES	Reserves $8,766	Reserves $56,108 Rent includes meals & maid svc. "Other" income is interest.	Reserves $7,608
AVG RNT/UNIT/MO	$290	$364	$178
AVG EXP/UNIT/YR	$2,684	$3,875	$1,905
OP.EXP / EGI	0.69	0.93	0.75
NOI/DEBT SVC	1.39	1.97	n/a

CASE# - INFO YR	#T-4 - 1986	#T-5 1988	#T-6 - 1986
INFO SOURCE	CMTY. ORG.	CMTY. ORG.	MGMT. CO.
NEIGHBORHOOD	Tenderloin	Tenderloin	Tenderloin
ADDRESS		Ellis St.	O'Farrell nr. Hyde
OWNERSHIP	non-profit	non-profit	private
BLDG TYPE	apts.	apts. w/comm.	apts. w/comm.
STRUCTURE			stucco exterior
# STORIES			4 + bsmnt, elevator
# RES UNITS	48 studios	42 studios	49 studios
COMMERCIAL	1 SPACE @ $1/SQFT	NONE	$1.10/sqft commercial 1 sp. @ 1000-1200sqft
GROSS INC RES	$172,052	$171,885	$223,778
OTHER	$3,050		
GROSS INC COMM		$31,095	$18,000
TOTAL GROSS INC	$175,102	$202,980	$241,778
VACANCY/LOSS	-6,580	-8,119	-9,671
EFFEC. GR. INC.	$168,522	$194,861	$232,105
OPER. EXPENSES	$113,931	$98,324	$107,964
NOI	$54,591	$96,537	$124,141
DEBT SERVICE	$38,240	$89,420	$80,952
BTCF	$18,351	$7,117	$43,189
NOTES	Reserves $12,257	Reserves $14,520	
AVG RNT/UNIT/MO	$299	$341	$381
AVG EXP/UNIT/YR	$2,374	$2,341	$2,203
OP.EXP / EGI	0.68	0.50	0.47
NOI/DEBT SVC	1.51	1.08	1.87

CASE# - INFO YR	#T-7 - 1988	#T-8 1986	#T-9 - 1988
INFO SOURCE	MGMT. CO.	Rent Board, REDI	Rent Board/ REDI
NEIGHBORHOOD	Tenderloin	Tenderloin	Tenderloin
ADDRESS	Jones @ Eddy	Post @ Hyde/Lvnwth	Hyde/O'Farrell
OWNERSHIP	private	private	private
BLDG TYPE	apts. & comm.	apts.	apts.
STRUCTURE	brick	URM	
# STORIES	8 + bsmnt, elevator	4 + bsmnt, 21244sqft	6 + bsmnt, elevator 16,590 sqft
# RES UNITS	50 studios	22 units (~3rm each)	23 (2 rooms each)
COMMERCIAL	2 comm. spaces		
GROSS INC RES	$184,080		
OTHER			
GROSS INC COMM	$15,600		
TOTAL GROSS INC	$199,680		
VACANCY/LOSS	-7,987		
EFFEC. GR. INC.	$191,692	$28,335	
OPER. EXPENSES	$114,204		$29,804
NOI	$77,488		
DEBT SERVICE	$95,796	$69,201	$71,832
BTCF	($18,307)		
NOTES	Refinanced last year.	Purchased & refi 7/83 Rent info avail only for 12 units occpd since '79-83. *** 1984 rents for	See T-19 MLS listing this property for sale 8/86. ***1986 rent level avg sought for
AVG RNT/UNIT/MO	$307	12 units $445 *** seeks $127/mo incr	13 units $375
AVG EXP/UNIT/YR	$2,284	$1,288	$1,242
OP.EXP / EGI	0.60		
NOI/DEBT SVC	.78		

CASE# - INFO YR	#T-10 - 1986	#T-11 1986
INFO SOURCE	Rent Board/ REDI	MLS 4/86
NEIGHBORHOOD	Tenderloin	Tenderloin
ADDRESS	Hyde/O'Farrell	Hyde/Post
OWNERSHIP	private	private
BLDG TYPE	apts.	apts.
STRUCTURE		brick
# STORIES	7 stories, 49,430sqft elevator	4 + pt. bsmnt
# RES UNITS	69 (`2rm each)	7 (1-ST, 6-1BR)
COMMERCIAL		
GROSS INC RES		$32,754
OTHER		
GROSS INC COMM		
TOTAL GROSS INC		$32,754
VACANCY/LOSS		
EFFEC. GR. INC.		
OPER. EXPENSES	$62,373	
NOI		
DEBT SERVICE	$162,442	$22,116
BTCF		
NOTES	Insurance increase.	ST rent- 378, 1BR 296-460. List price = $385,000
AVG RNT/UNIT/MO	***1986 rent level avg. sought for 41 units $365	
AVG EXP/UNIT/YR	$904	
OP.EXP / EGI		
NOI/DEBT SVC		

CASE# - INFO YR	T-12 - 1986	#T-13 1986	#T-14 - 1986
INFO SOURCE	MLS	MLS	MLS
NEIGHBORHOOD	Tenderloin	Tenderloin	Tenderloin
ADDRESS	Geary/Jones	O'Farrell/Hyde	Eddy/Leavenworth
OWNERSHIP	private	private	private
BLDG TYPE	apts + "workshops"	apts	hotel w/comm
STRUCTURE		steel & concrete	brick
# STORIES	4+ pt bsmnt, elevator	4+bsmnt, elevator	3 story, pt bsmnt
# RES UNITS	38 (36 ST , 2 1-BR)	33 (32ST, 1 2-BR)	34 furnished units 4 BA
COMMERCIAL			3 storefronts
GROSS INC RES	$154,000	$168,360	est. 30,000
GROSS INC COMM			est. 40,000
TOTAL GROSS INC	$154,000	$168,360	$70,980
VACANCY/LOSS	-7,700	$8,418	$3,549
EFFEC. GR. INC.	$146,300	$159,942	$67,431
OPER. EXPENSES	$71,250	$42,533	
NOI	$75,050	$117,409	
DEBT SERVICE			
BTCF			
NOTES	1st deed = 600,000 List: $1.46 mill Separate meters ST: $255-400 1-BR: $400	1st deed = 983,236 due 1992, 9.02%adj indiv. heat St: $ 364-485, 2BR: $750 List: $1.425 mill	Comm: $1000/1250 Lot 40x82.5 List: $895k
AVG RNT/UNIT/MO	$338	$425	$74
AVG EXP/UNIT/YR	$1,875	$1,289	
OP.EXP / EGI	0.49	0.27	
NOI/DEBT SVC			

CASE# - INFO YR	#T-15 - 1986	#T-16 - 1986	#T-17 - 1988
INFO SOURCE	MLS	MLS	MLS
NEIGHBORHOOD	Tenderloin	Tenderloin	Tenderloin
ADDRESS	Jones/Geary	Leavenworth/Geary	Eddy /Larkin
OWNERSHIP	private	private	private
BLDG TYPE	apts.w/comm	apts	apts
STRUCTURE	brick		reinf concrete
# STORIES	4	4 + bsmnt, elevator	4 + pt bsmnt,
# RES UNITS	5 ST	24 (14 ST, 9 1-BR 1 2-BR)	34 (29 ST, 5 1-BR)
COMMERCIAL	1 comm bar @1500/mo		
GROSS INC RES	$27,960	$117,780	$156,000
GROSS INC COMM	$18,000		
TOTAL GROSS INC	$45,980	$117,780	$156,000
VACANCY/LOSS		$5,889	$7,800
EFFEC. GR. INC.		$111,891	$148,200
OPER. EXPENSES		$37,317	$41,000
NOI		$74,574	$107,200
DEBT SERVICE		$71,569	$107,424
BTCF		$3,006	($224)
NOTES	List: $425,000 lot 25x137.5 ST: 375-475	1st deed: $502k, 12% adj, $5465/mo 2nd: $42,200, $499/mo ST: $255-375, 1-BR: $313-499, 2-BR: 539	1st deed: 895000, due 1999, 11.25%, 8952/mo List: $1.248 mill ST: 200-400 1BR 350-475
AVG RNT/UNIT/MO	$466	$409	$382
AVG EXP/UNIT/YR		$1,555	$1,206
OP.EXP / EGI	0.68	0.33	0.28
NOI/DEBT SVC		1.04	1.00

CASE# - INFO YR	#T-16 - 1986	#T-19 - 1986	#T-20 - 1986
INFO SOURCE	BROKER	MLS	MLS
NEIGHBORHOOD	Tenderloin	Tenderloin	Tenderloin
ADDRESS	O'Farrell/Jones	Hyde/O'Farrell	O'Farrell/Larkin
OWNERSHIP	private	private	private
BLDG TYPE	apts	apts.w/comm	apts.w/comm
STRUCTURE	brick, URM	concrete	brick
# STORIES	elevator	6+bsmnt, elevator	4 + pt bsmnt
# RES UNITS	26 studios	23 (22 ST, 1 1-BR)	41 (38 ST, 2 1-BR, 1 2-BR)
COMMERCIAL		1 comm. @ $625/mo	3 comm @ $750-650
GROSS INC RES	$112,164	$105,363	est 211,200
OTHER	$6,700		
GROSS INC COMM		$7,500	est 26,800
TOTAL GROSS INC	$120,664	$112,863	$240,000
VACANCY/LOSS	$4,835	$5,643	$12,000
EFFEC. GR. INC.	$116,029	$107,220	$226,000
OPER. EXPENSES	$61,457	$35,000	$76,000
NOI	$54,572	$72,220	$150,000
DEBT SERVICE	$71,206	$71,628	
BTCF	($16,636)	$592	
NOTES	Has more debt. Other income is parking. ST: 266-450 List:$1.125 mill	Indiv meter. 1st deed: $418k, due 1999, 11.75%, 2nd: $210k, due 1989, 10%, Rent Bd petition 1986	Separate meters. List: $1.95 mill lot 50x85 ST: 241-550 1BR 650, 2BR 1000
LOAN TERMS		See #T-9 ST: 244-500 1BR 500	
AVG RNT/UNIT/MO	$360	$362	$429
AVG EXP/UNIT/YR	$2,364	$1,522	$1,902
OP.EXP / EGI	0.53	0.33	0.34
NOI/DEBT SVC	0.77	1.01	

CASE# - INFO YR	#T-21 - 1986	#T-22 - 1986	#T-23 - 1986
INFO SOURCE	MLS	MLS	Broker
NEIGHBORHOOD	Tenderloin	Tenderloin	Tenderloin
ADDRESS	Post/Jones	Eddy/Jones	Post/Larkin
OWNERSHIP	private	private	private
BLDG TYPE	hotel	apts.w/comm	apts.
STRUCTURE		steel	brick
# STORIES	5, elevator	4+, elevator	5
# RES UNITS	123 rooms (50 w/BA)	105 (70effic, 30ST, 5 1-BR)	64 (53 1-BR 9-ST, 1 2-BR)
COMMERCIAL		5 comm @ $550-3000	
GROSS INC RES	$600,000	est 451,980	$343,512
			$5,000
GROSS INC COMM		est 105,000	
TOTAL GROSS INC	$600,000	$556,980	$348,512
VACANCY/LOSS		$27,849	$7,000
EFFEC. GR. INC.		$529,131	$341,512
OPER. EXPENSES		$251,227	$135,000
NOI		$277,904	$206,512
DEBT SERVICE		$251,496	n/a
BTCF		$26,408	
NOTES	50 rms have transient permit	Effic: 226-400 ST: 235-500 1-BR: 312-550 List: $3.8 mill 1st: 2 mill, due 1990 12.25%., 20,958/mo	ST $320-460 1-BR $305-575
AVG RNT/UNIT/MO	$407	$359	$447
AVG EXP/UNIT/YR		$2,393	$2,109
OP.EXP / EGI		0.47	0.40
NOI/DEBT SVC		1.11	1.01

CASE# - INFO YR	#T-24 - 1986	#T-25 - 1986	#T-26 - 1986
INFO SOURCE	Broker	Broker	Broker
NEIGHBORHOOD	Tenderloin	Tenderloin	Tenderloin
ADDRESS	Turk/Hyde	Leavenworth	Larkin/Turk
OWNERSHIP	Private	Private	Private
BLDG TYPE	Apts.	Apts.	Apts.
STRUCTURE		Concrete & Timber	
# STORIES		6, elevator	
# RES UNITS	20 ST	36 (12-1BR, 24-ST)	50 (5-1BR, 45-ST)
COMMERCIAL			Office & Store
GROSS INC RES	$74,520	$135,924	$231,600
OTHER		$600	
GROSS INC COMM			$50,400
TOTAL GROSS INC	$74,520	$136,524	$282,000
VACANCY/LOSS	$1,490	$5,461	$11,280
EFFEC. GR. INC.	$73,030	$131,063	$270,720
OPER. EXPENSES	$36,332	$57,324	$48,264
NOI	$37,698	$73,739	$222,456
DEBT SERVICE			
BTCF			
NOTES			Missing expense data.
AVG RNT/UNIT/MO	$310	$315	$386
AVG EXP/UNIT/YR	$1,817	$1,592	$965
OP.EXP / EGI	.50	.44	.18
NOI/DEBT SVC			

CASE# - INFO YR	#T-27 - 1986
INFO SOURCE	Broker
NEIGHBORHOOD	Tenderloin
ADDRESS	Geary/Lvnwth
OWNERSHIP	Private
BLDG TYPE	Apts.
STRUCTURE	Brick & Concrete
# STORIES	4
# RES UNITS	35 (29-ST, 6-1BR)
COMMERCIAL	4 Stores
GROSS INC RES	$162,584
OTHER	
GROSS INC COMM	$41,570
TOTAL GROSS INC	$204,154
VACANCY/LOSS	$8,166
EFFEC. GR. INC.	$195,988
OPER. EXPENSES	$84,250
NOI	$111,738
DEBT SERVICE	n/a
BTCF	
NOTES	
AVG RNT/UNIT/MO	$387
AVG EXP/UNIT/YR	$2,407
OP.EXP / EGI	.43
NOI/DEBT SVC	

CASE# - INFO YR	#B-1 - 1986	#B-2 - 1986	#B-3 - 1986
INFO SOURCE	MGMT. CO.	MGMT. CO.	MGMT. CO.
NEIGHBORHOOD	Bush Street	Bush Street	Bush Street
ADDRESS	Sutter @ Taylor	Bush @ Leavenworth	Bush @ Mason
OWNERSHIP	private	private	private
BLDG TYPE	ALL COMMERCIAL	apts. w/comm.	apts. & rooms
STRUCTURE	brick	brick	brick
# STORIES	6+bsmnt	4 + bsmnt	5 + basemnt
# RES UNITS	none	11 ST, 10 1-BR	10 rms, 25 ST,10 1-BR
COMMERCIAL	24 tenants ,37Ksqft	2 spaces drugstore/printshop	none
GROSS INC RES		(*) $108,000	(*) $208,000
	*** $2/sqft grnd flr.	other $300	
GROSS INC COMM	$1.60 above	(*) 30,000	none
TOTAL GROSS INC		(*) $138,300	(*) $208,000
VACANCY/LOSS		(*)	(*)
EFFEC. GR. INC.		(*) $138,300	(*) $208,000
OPER. EXPENSES	see pro forma	$43,500	$100,000
NOI		$94,800	$108,000
DEBT SERVICE	see pro forma	$82,860	$108,000
BTCF		$11,940	0
NOTES		***DS does not incl. principal. (*) Income figures are effective income.	**DS does not incl. principal (*) Income figures are effective income.
AVG RNT/UNIT/MO		$429	$385
AVG EXP/UNIT/YR		$2,071	$2,222
OP.EXP / EGI		0.31	0.48
NOI/DEBT SVC			

CASE# - INFO YR	#B-4 - 1986	#B-5 - 1986	#B-6 - 1986
INFO SOURCE	MGMT. CO.	MGMT. CO.	MLS
NEIGHBORHOOD	Bush Street	Bush Street	Bush Street
ADDRESS	Bush @ Jones	Bush St.	Post/Polk
OWNERSHIP	private	private	private
BLDG TYPE	apts. & rooms	apts w/comm .	apts
STRUCTURE	brick	stucco ext.	reinf. concrete
# STORIES	6 + basement	3+ bsmnt	4+
# RES UNITS	10 rms, 30 ST,15 1-BR	13 ST & 1-BR	27 studios
COMMERCIAL	none	1 comm sp 300sqft med	
GROSS INC RES	(*) $213,144	(*) $49,080	$114,292
GROSS INC COMM	none	$3,900	
TOTAL GROSS INC	$213,144	$52,980	$114,292
VACANCY/LOSS	(*)	(*)	5,715
EFFEC.GR.INC.	$213,144	$52,980	$108,577
OPER. EXPENSES	$80,000	$38,652	$31,350
NOI	$133,144	$14,328	$77,227
DEBT SERVICE	$129,612	$36,204	$55,992
BTCF	$3,532	($21,876)	$21,235
NOTES	Renov. in 1986. RM 227-340 ST 270-550 (*) Income figures are effective inc.	Int=2845/mo, PR=172 loan is 7 yrs old 30 year orig term (*) Income figures are effective inc.	List $975,000 ST $268-479 1st deed - $490K, 11% due 1995. $4666/mo
AVG RNT/UNIT/MO	$323	$315	$353
AVG EXP/UNIT/YR	$1,455	$2,760	$1,161
OP.EXP / EGI	0.38	0.73	0.29
NOI/DEBT SVC	1.03		1.38

CASE# - INFO YR	#B-7 - 1988	#B-8 1988	#B-9 1986
INFO SOURCE	MLS	Rent Board & REDI	MLS
NEIGHBORHOOD	Bush Street	Bush Street	Bush Street
ADDRESS	Bush/Hyde/Lvnwth	Bush @ Jones	Post/Jones
OWNERSHIP	private	private	private
BLDG TYPE	apts.	apts	hotel w/comm
STRUCTURE	wood ext.	brick	brick
# STORIES	4+, elevator	6 + bsment, elevator	3
# RES UNITS	16 (9ST, 7 1-BR)	35 (2-3 rms each)	25 rooms
COMMERCIAL		none	corner (?) grocery 1 unit, 3500 sqft
GROSS INC RES	$89,708	$218,832	$42,000
GROSS INC COMM			$54,000
TOTAL GROSS INC	$69,708	$218,832	$96,000
VACANCY/LOSS	3,485	10.942	
EFFEC. GR. INC.	$66,223	$207,890	
OPER. EXPENSES	$20,000	$58,511	
NOI	$46,223	$151,379	
DEBT SERVICE	$20,220	$111,692	
BTCF	$23,003	$39,687	
NOTES	List $750,000 Lot 30x137, zone R5-c ST: 175-281 1-BR: 302-650 1st: $175,869, $1,885/mo.	Income includes rent incr for '86. Without incr, income = $193,656 (LL seeks ~13% increases. W/o increases, avg rent is $461.	List 1,090,000
AVG RNT/UNIT/MO	$363	$521	$140
AVG EXP/UNIT/YR	$1,250	$1,615	
OP.EXP / EGI	0.30	0.27	
NOI/DEBT SVC	2.29	1.36	

CASE# - INFO YR	#8-10 1986	#8-11 - 1988	#8-12 - 1988
INFO SOURCE	Rent Board & REDI	MLS	MLS
NEIGHBORHOOD	Bush Street	Bush Street	Bush Street
ADDRESS	Jones/CA	Lvnwth/Post/Sttr	Post/Polk
OWNERSHIP	private	private	private
BLDG TYPE	apts	apts	hotel w/comm
STRUCTURE		reinf concr	reinf concr
# STORIES	6+ Bsmnt	3 + pt bsmnt	3 + bsmnt
# RES UNITS	58 (avg 2 rm each)	10 (7ST, 3 1-BR)	22 rooms, 10 BA
COMMERCIAL			1 comm @ 2600/mo
GROSS INC RES		$40,820	$78,800
GROSS INC COMM			31,200
TOTAL GROSS INC		$40,820	$108,000
VACANCY/LOSS		2,031	5,400
EFFEC. GR. INC.		$38,589	$102,800
OPER. EXPENSES		$9,094	$22,780
NOI		$29,495	$79,820
DEBT SERVICE		$5,364	N/A
BTCF		$24,131	
NOTES	Insurance incr. from $3612 '85 to $18,762 in 1986. Avg rent on 25 units for wh incr sought: 1985: 492; 1986: 530 = 7.7% increase	Separate meters, List: $429K ST:$224-500 1-BR: $303-340 More expenses. 1st: 18,000 due 1990 6.5%, $447/mo	Rooms: 150-340/mo List: $675k 1st: $350k, due 2000, 13.25% More expenses.
AVG RNT/UNIT/MO		$339	$291
AVG EXP/UNIT/YR		$909	$1,035
OP.EXP / EGI		0.24	0.22
NOI/DEBT SVC		5.58	

CASE# - INFO YR	#B-13 1986	#B-14 - 1986	#B-15 - 1986
INFO SOURCE	MLS	MLS	MLS
NEIGHBORHOOD	Bush Street	Bush Street	Bush Street
ADDRESS	Calif./Hyde	Bush / Jones	Bush/
OWNERSHIP	private	private	private
BLDG TYPE	apts	apts.	apts
STRUCTURE	wood frame	brick	brick
# STORIES	3+ Bsmnt	4 + bsmt., elevator	3+ bsmnt
# RES UNITS	12 (6-ST, 6-1BR)	57 (35ST, 17 1-BR, 5 2-BR)	14 (7ST, 6 1-BR, 1 3-BR)
COMMERCIAL	2 Stores		1 comm sp @ $300
GROSS INC RES	$63,972	$266,000	$61,056
GROSS INC COMM	$9,180		$3,600
TOTAL GROSS INC	$73,152	$266,000	$64,656
VACANCY/LOSS	$3,658	13,300	3,223
EFFEC. GR. INC	$69,494	$252,700	$61,423
OPER. EXPENSES	$16,713	$31,142	$21,799
NOI	$53,781	$221,558	$39,624
DEBT SERVICE	n/a	$62,784	
BTCF		$158,774	
NOTES	Missing expenses	Indiv meters ST: 130-450 1-BR: 287-575 2-BR 451-660 List: $2.5 mill 1st: 606,000 due 198 $5232/mo, 9%, 2nd du 1933, 60,000 11% More expenses.	ST:275-300 1-BR:
AVG RNT/UNIT/MO	$444	$389	$363
AVG EXP/UNIT/YR	$1,393	$546	$1,557
OP.EXP / EGI	0.24	0.12	0.35
NOI/DEBT SVC		3.53	

CASE# - INFO YR	#8-18 1986	#8-17 - 1986
INFO SOURCE	Broker	Broker
NEIGHBORHOOD	Bush Street	Bush Street
ADDRESS	Bush/Taylor	Bush/Hyde
OWNERSHIP	private	private
BLDG TYPE	apts	apts.
STRUCTURE	Reinf. concrete	concrete
# STORIES		5
# RES UNITS	39 (36-ST, 3 RM)	24 (20ST, 4 1-BR)
COMMERCIAL		
GROSS INC RES	$180,936	$132,689
	$1,200	
GROSS INC COMM		
TOTAL GROSS INC	$182,136	$132,689
VACANCY/LOSS	$4,553	$5,308
EFFEC. GR. INC	$177,583	$127,381
OPER. EXPENSES	$73,428	$49,062
NOI	$104,155	n/a
DEBT SERVICE	n/a	
BTCF		
NOTES		
AVG RNT/UNIT/MO	$379	$444
AVG EXP/UNIT/YR	$1,883	$2,044
OP.EXP / EGI	0.41	0.39
NOI/DEBT SVC		

TABLE VI-2 OPERATING EXPENSE DETAIL

CASE #	C-12		C-13		C-22	
NEIGHBORHOOD	CHINATOWN		CHINATOWN		CHINATOWN	
	BROKER		BROKER		CMTY ORG.	
INFO YEAR	1986		1986		1986	
OWNERSHIP	PRIVATE		PRIVATE		NONPROFIT	
RES UNITS	83 RMS		47 RMS		65 RMS	
COMMERCIAL	BANK & RETAIL		CLUB		5200 SQFT	
EFF. GR. INCOME (EGI)					$252,610	
EXPENSES:	TOTAL	PER UNIT PER YEAR	TOTAL	PER UNIT PER YEAR	TOTAL	PER UNIT PER YEAR
ADMINISTRATION						
Mgment fee					$12,264	
On-site mgment			$4,200	$89	$9,900	
Fringe benefits					$5,004	
Other (legal, actg, adv., etc.)			$240		$3,024	
TOTAL ADMINISTRATION			$4,440	$94	$30,192	$464
UTILITIES						
PG&E			$6,000		$8,796	$135
Water			$2,640		$2,448	$38
Garbage			$13,068		$2,916	$45
Other					$300	
TOTAL UTILITIES	$23,760	$286	$21,708	$462	$14,460	$222
MAINTENANCE						
Staff					$9,972	
Other					$4,668	
TOTAL MAINTENANCE					$14,640	$225
OTHER						
PROPERTY TAX					$17,748	
INSURANCE	$11,600	$140	$20,280	$431	$36,432	$560
TOTAL OPER. EXPENSES			$46,428	$988	$113,472	$1,746
OPER EXP/RES UNIT/YR					$1,746	
OPER EXP/EGI					0.45	
MISSING DATA	MGM,MAINT & REPAIR UTILITIES, TAX		MGM, MAINT,TAX			

SOURCE: DATA COLLECTED BY RESEARCH TEAM.

TABLE VI-2 OPERATING EXPENSE DETAIL

CASE #	C-17		C-18		C-16	
NEIGHBORHOOD	CHINATOWN		CHINATOWN		CHINATOWN	
	CMTY ORG		CMTY ORG		CMTY ORG	
INFO YEAR	1985		1985		1985	
OWNERSHIP	NONPROFIT		NONPROFIT		NONPROFIT	
RES UNITS	82 RMS		34 RMS		24 APTS	
COMMERCIAL	3500 SQFT		2821 SQFT		2950 SQFT	
EFF. GR. INCOME (EGI)	$192,334		$96,473		$107,984	
EXPENSES:	TOTAL	PER UNIT PER YEAR	TOTAL	PER UNIT PER YEAR	TOTAL	PER UNIT PER YEAR
ADMINISTRATION						
Mgment fee	$10,297				$5,417	
On-site mgment	$9,500		$7,850			
Fringe benefits	$8,398		$2,782		$1,037	
Other (legal, actg, adv., etc.)	$3,047		$5,757		$1,020	
TOTAL ADMINISTRATION	$31,242	$378	$16,389	$349	$7,474	$115
UTILITIES						
PG&E	$8,300	$100	$5,801	$123	$8,382	$129
Water	$3,653	$44	$3,421	$73	$3,811	$58
Garbage	$3,182	$38	$2,271	$48	$1,549	$24
Other	$335		$269		$264	
TOTAL UTILITIES	$15,470	$186	$11,762	$250	$13,806	$212
MAINTENANCE						
Staff	$12,062		$1,604		$2,106	
Other	$5,529		$2,257		$3,514	
TOTAL MAINTENANCE	$17,591	$212	$3,861	$82	$5,620	$86
OTHER						
PROPERTY TAX	$10,188		$5,872		$7,587	
INSURANCE	$5,526	$67	$5,255	$112	$5,867	$90
TOTAL OPER. EXPENSES	$80,017	$964	$43,139	$918	$40,354	$621
OPER EXP/RES UNIT/YR	$976		$1,269		$1,681	
OPER EXP/EGI	0.42		0.45		0.37	
MISSING DATA			NO MGM FEE			

SOURCE: DATA COLLECTED BY RESEARCH TEAM.

TABLE VI-2 OPERATING EXPENSE DETAIL

CASE #	C-21		C-19		T-5	
NEIGHBORHOOD	CHINATOWN		CHINATOWN		TENDERLOIN CMTY ORTG	
INFO YEAR	1985/86		1984		1986	
OWNERSHIP	PRIVATE		PRIVATE		NONPROFIT	
RES UNITS	17 APTS		15 APTS		42 APTS	
COMMERCIAL					2 UNITS	
EFF. GR. INCOME (EGI)	$69,892				$194,881	
EXPENSES:	TOTAL	PER UNIT PER YEAR			TOTAL	PER UNIT PER YEAR
ADMINISTRATION						
Mgment fee	$1,370				$14,520	
On-site mgment			$240		$9,000	
Fringe benefits					$2,340	
Other (legal, actg, adv., etc.)	$375		$468		$2,820	
TOTAL ADMINISTRATION	$1,745	$21	$708	$15	$28,880	$441
UTILITIES						
PG&E			$3,200	$68	$10,800	$188
Water	$1,405	$17	$1,788	$38	$11,460	$178
Garbage	$753	$9	$1,208	$26	$3,380	$52
Other					$1,100	
TOTAL UTILITIES	$2,158	$28	$8,196	$132	$26,720	$411
MAINTENANCE						
Staff					$9,480	
Other	$10,831		$2,083		$10,784	
TOTAL MAINTENANCE	$10,831	$130	$2,083	$44	$20,244	$311
OTHER						
PROPERTY TAX	$3,024		$3,580		$18,180	
INSURANCE	$8,338	$100	$3,158	$67	$8,500	$100
TOTAL OPER. EXPENSES	$26,098	$314	$15,723	$335	$98,324	$1,513
OPER EXP/RES UNIT/YR	$1,535		$1,048		$2,341	
OPER EXP/EGI	0.37				0.50	
MISSING DATA	PG&E		MGMT			

SOURCE: DATA COLLECTED BY RESEARCH TEAM.

TABLE VI-2 OPERATING EXPENSE DETAIL

CASE #	T-6		T-7		T-8	
NEIGHBORHOOD	TENDERLOIN MGMT. CO.		TENDERLOIN MGMT. CO.		TENDERLOIN	
INFO YEAR	1986		1986		1984	
OWNERSHIP	PRIVATE		PRIVATE		PRIVATE	
RES UNITS	49 APTS		50 APTS		22 APTS	
COMMERCIAL	1 UNIT					
EFF. GR. INCOME (EGI)	$241,776		$191,692		N/A	
EXPENSES:	TOTAL	PER UNIT PER YEAR	TOTAL	PER UNIT PER YEAR	TOTAL	PER UNIT PER YEAR
ADMINISTRATION						
Mgment fee	$14,400					
On-site mgment	$12,420		$6,000			
Fringe benefits			$4,500			
Other (legal, actg, adv., etc.)	$5,595					
TOTAL ADMINISTRATION	$32,415	$391	$10,500	$223	$3,800	$58
UTILITIES						
PG&E	$15,819	$191				
Water					$5,022	$77
Garbage	$3,000	$36			$1,834	$28
Other						
TOTAL UTILITIES	$18,819	$227			$6,856	$105
MAINTENANCE						
Staff						
Other	$43,530					
TOTAL MAINTENANCE	$43,530	$524			$8,340	$128
OTHER						
PROPERTY TAX					$6,978	
INSURANCE	$13,200	$159	$20,000	$426	$2,361	$36
TOTAL OPER. EXPENSES	$107,964	$1,301	$114,204	$2,430	$28,335	$436
OPER EXP/RES UNIT/YR	$2,203		$2,284		$1,288	
OPER EXP/EGI	0.47		0.60			
MISSING DATA	WATER, TAX		DETAIL NOT AVAIL.		ADMIN, MAINT	

SOURCE: Data collected by research team.

TABLE VI-2 OPERATING EXPENSE DETAIL

CASE #	T-9		T-10		T-23	
NEIGHBORHOOD	TENDERLOIN		TENDERLOIN		TENDERLOIN BROKER	
INFO YEAR	1985		1985		1986	
OWNERSHIP	PRIVATE		PRIVATE		PRIVATE	
RES UNITS	24 APTS		69 APTS		64 APTS	
COMMERCIAL						
EFF. GR. INCOME (EGI)					$341,512	
EXPENSES:	TOTAL	PER UNIT PER YEAR	TOTAL	PER UNIT PER YEAR	TOTAL	PER UNIT PER YEAR
ADMINISTRATION						
Mgment fee			$13,325			
On-site mgment						
Fringe benefits						
Other (legal, actg, adv., etc.)			$2,879			
TOTAL ADMINISTRATION	$3,311	$138	$16,204	$235	$36,250	$954
UTILITIES						
PG&E	$7,183	$299			$12,400	
Water	$2,257	$94	$3,617	$52	$9,000	
Garbage	$1,268	$53	$2,926	$42	$5,400	
Other						
TOTAL UTILITIES	$10,708	$446	$6,543	$95	$26,800	$705
MAINTENANCE						
Staff						
Other	$211		$9,909		$17,950	
TOTAL MAINTENANCE	$211		$9,909	$144	$17,950	$472
OTHER						
PROPERTY TAX	$10,611		$9,422		$38,000	
INSURANCE	$4,963	$207	$20,295	$294	$16,000	$421
TOTAL OPER. EXPENSES	$29,604	$1,242	$62,373	$904	$135,000	$3,553
OPER EXP/RES UNIT/YR	$1,242		$904		$2,109	
OPER EXP/EGI					0.40	
MISSING DATA	ADMIN.,MAINT		MGMT, PG&E		TAX REFLECTS 1986 SALE	

SOURCE: Data collected by research team.

TABLE VI-2 OPERATING EXPENSE DETAIL

CASE #	T-12		T-18		T-24	
NEIGHBORHOOD	TENDERLOIN BROKER		TENDERLOIN BROKER		TENDERLOIN BROKER	
INFO YEAR	1986		1986		1986	
OWNERSHIP	PRIVATE		PRIVATE		PRIVATE	
RES UNITS	38 APTS		26	RMS&APTS	20 APTS	
COMMERCIAL			NONE		NONE	
EFF. GR. INCOME (EGI)	$146,300		$116,029		$73,030	
EXPENSES:	TOTAL	PER UNIT PER YEAR	TOTAL	PER UNIT PER YEAR	TOTAL	PER UNIT PER YEAR
ADMINISTRATION						
Mgmnt fee	$12,000					
On-site mgmnt						
Fringe benefits						
Other (legal, actg, adv., etc.)	$5,600					
TOTAL ADMINISTRATION	$17,600	$733	$12,200	$177	$7,644	$201
UTILITIES						
PG&E			$8,329		$4,575	
Water			$7,856	$114	$3,949	$104
Garbage			$2,355	$34	$954	$25
Other						
TOTAL UTILITIES	$24,000	$1,000	$18,540	$269	$9,478	$249
MAINTENANCE						
Staff						
Other			$10,600		$6,800	
TOTAL MAINTENANCE	$12,000	$500	$10,600	$154	$6,800	$179
OTHER			$792			
PROPERTY TAX	$7,650		$12,825		$7,410	
INSURANCE	$10,000	$417	$6,500	$94	$5,000	
TOTAL OPER. EXPENSES	$71,250	$2,969	$61,457	$891	$36,332	$956
OPER EXP/RES UNIT/YR	$1,875		$2,364		$1,817	
OPER EXP/EGI	0.49		0.53		0.50	
MISSING DATA						

SOURCE: Data collected by research team.

TABLE VI-2 OPERATING EXPENSE DETAIL

CASE #	T-25		T-26		T-27		
NEIGHBORHOOD	TENDERLOIN BROKER		TENDERLOI BROKER		TENDERLOIN BROKER		N
INFO YEAR	1986		1986		1986		
OWNERSHIP	PRIVATE		PRIVATE		PRIVATE		
RES UNITS	36 APTS		50 APTS		35 APTS		
COMMERCIAL			2 UNITS		4 UNITS		
EFF. GR. INCOME (EGI)	$131,063		$270,720		$195,988		
EXPENSES:	TOTAL	PER UNIT PER YEAR	TOTAL	PER UNIT PER YEAR	TOTAL	PER UNIT PER YEAR	
ADMINISTRATION							
Mgment fee							
On-site mgment	$12,600				$12,000		
Fringe benefits							
Other (legal, actg, adv., etc.)							
TOTAL ADMINISTRATION	$12,600	$525			$12,000	$316	
UTILITIES							
PG&E	$15,059		$21,780		$18,000		
Water	$9,916	$413	$11,700		$4,800		
Garbage	$2,472	$103	$2,664		$3,360		
Other							
TOTAL UTILITIES	$27,447	$1,144	$36,144	$723	$26,160	$688	
MAINTENANCE							
Staff							
Other	$480		$2,520		$14,000		
TOTAL MAINTENANCE	$480	$20			$14,000	$368	
OTHER							
PROPERTY TAX	$12,500				$21,090		
INSURANCE	$4,297		$9,600	$139	$11,000	$289	
TOTAL OPER. EXPENSES	$57,324	$2,389			$84,250	$2,217	
OPER EXP/RES UNIT/YR	$1,592				$2,407		
OPER EXP/EGI	0.44				0.43		
MISSING DATA			TAX, ADMIN. MAINTENANCE		TAX REFLECTS 1986 SALE		

SOURCE: Data collected by research team.

TABLE VI-2 OPERATING EXPENSE DETAIL

CASE #	B-2		B-3		B-4	
NEIGHBORHOOD	BUSH MGMT. CO.		BUSH MGMT. CO.		BUSH MGMT. CO.	
INFO YEAR	1986		1986		1986	
OWNERSHIP	PRIVATE		PRIVATE		PRIVATE	
RES UNITS	21 APTS		45 RMS&APTS		55 RMS&APTS	
COMMERCIAL	2 UNITS		NONE		NONE	
EFF. GR. INCOME (EGI)	$136,300		$208,000		$213,144	
EXPENSES:	TOTAL	PER UNIT PER YEAR	TOTAL	PER UNIT PER YEAR	TOTAL	PER UNIT PER YEAR
ADMINISTRATION						
Mgment fee	$6,623		$9,686		$11,191	
On-site mgment	$5,400		$10,768		$15,889	
Fringe benefits	$595		$1,878		$3,617	
Other (legal, actg, adv., etc.)	$1,587		$10,672		$1,547	
TOTAL ADMINISTRATION	$18,206	$195	$33,184	$706	$32,044	$493
UTILITIES						
PG&E	$3,337	$40	$6,557		$11,863	
Water	$2,317	$28	$2,586	$55	$4,357	$67
Garbage	$1,023	$12	$2,581	$54	$4,930	$76
Other						
TOTAL UTILITIES	$6,678	$80	$11,703	$249	$21,150	$325
MAINTENANCE						
Staff						
Other	$8,725		$7,630		$11,681	
TOTAL MAINTENANCE	$6,725	$105	$7,630	$162	$11,881	$180
OTHER	$3,292		$26,725		$1,207	
PROPERTY TAX	$920		$3,533		$13,919	
INSURANCE	$7,680	$93	$15,225	$324		
TOTAL OPER. EXPENSES	$43,500	$524	$100,000	$2,128	$80,000	$1,231
OPER EXP/RES UNIT/YR	$2,071		$2,222		$1,455	
OPER EXP/EGI	0.31		0.48		0.38	
MISSING DATA						

SOURCE: Data collected by research team.

TABLE VI-2 OPERATING EXPENSE DETAIL

CASE #	B-8		B-16		B-17	
NEIGHBORHOOD	BUSH		BUSH BROKER		BUSH BROKER	
INFO YEAR	1985/86		1986		1986	
OWNERSHIP	PRIVATE		PRIVATE		PRIVATE	
RES UNITS	35 APTS		39 APTS		24 APTS	
COMMERCIAL						
EFF. GR. INCOME (EGI)	$218,832		$177,583		$127,381	
EXPENSES:	TOTAL	PER UNIT PER YEAR	TOTAL	PER UNIT PER YEAR	TOTAL	PER UNIT PER YEAR
ADMINISTRATION						
Mgment fee						
On-site mgment						
Fringe benefits						
Other (legal, actg,	$2,420					
adv., etc.)	$10,521					
TOTAL ADMINISTRATION	$12,941	$156	$18,540	$394	$13,000	$200
UTILITIES						
PG&E			$12,720		$5,000	
Water	$4,059	$49	$3,816	$81	$1,900	$29
Garbage	$3,770	$45	$4,740	$101	$4,380	$67
Other						
TOTAL UTILITIES	$7,829	$94	$21,276	$453	$11,280	$174
MAINTENANCE						
Staff						
Other	$9,578		$11,784		$6,032	
TOTAL MAINTENANCE	$9,578	$115	$11,784	$251	$6,032	$93
OTHER						
PROPERTY TAX	$19,129		$12,828		$12,750	
INSURANCE	$7,034		$9,000		$6,000	
TOTAL OPER. EXPENSES	$56,511	$681	$73,428	$1,754	$49,062	$755
OPER EXP/RES UNIT/YR	$1,615		$1,883		$2,044	
OPER EXP/EGI	0.27		0.41		0.39	
MISSING DATA	MGMT., PG&E					

SOURCE: Data collected by research team.

BIBLIOGRAPHY

1986 San Francisco Board of Realtors, *Comparable Book*, Vol. 20 (October 1 - December 31, 1985) and Vol.1 (January 1 - March 31, 1986.)

1986 San Francisco Board of Realtors, *Realtors Multiple Sales Service*. April 21, 1986 and June 30, 1986.

1983 San Francisco Department of City Planning, *North of Market Rezoning Study*.

1985 San Francisco Department of City Planning, *Residential Hotel Unit Conservation and Demolition Ordinance Status Report*.

1986 San Francisco Department of City Planning, "Housing in Chinatown," *Chinatown Planning and Rezoning Study Background Issue Papers*.

1986 San Francisco Department of Public Works, Bureau of Building Inspection Survey of Hazardous Buildings.

1986 San Francisco Department of Public Works, Property Conservation Division Apartment and Hotel Statistics.

1986 "Special Report on Tax Reform." *Housing and Development Reporter*, August 25, 1986.

1986 *The San Francisco Apartment House Directory*, Raybern and Company, Inc., San Leandro, California.

1980 U.S. Bureau of the Census. 1980 Census of Population and Housing. Census Tracts. California.

Paul, Brad, Steve Thompson, Scott Williams and Margeigh Joy.
1985 "The Tenderloin: An Urban Residential Typology." San Francisco, California: North of Market Planning Coalition and Gensler and Assoc. Architects.

Roberts, Benson F. and James Pickman.
1986 *A Community Development Practioner's Guide to the Tax Reform Act of 1986: Low-Income Housing Tax Credits and Other Provisions*, James Pickman & Associates, Inc., Washington, D.C.

Wood, Michael and Rob Waters.
1986 "Tenderloin Rents Soaring, Times Survey Finds," *The Tenderloin Times*, April 1986, p.1.